

SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class matter. Copyrighted, 1893, by Munn & Co.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXIX.—No. 3.
ESTABLISHED 1845.

NEW YORK, JULY 15, 1893.

\$3.00 A YEAR.
WEEKLY.

THE KRUPP EXHIBIT AT THE GREAT FAIR.

Of all the foreign nations that are taking part in the World's Columbian Exposition at Chicago, Germany takes the lead, in extent, variety, cost and superiority in almost every characteristic. Of the private exhibitors, whether foreign or American, Krupp, the great metal manufacturer of Germany, stands at the head. His exhibit is wonderful, and by its greatness almost dwarfs all other exhibits in the same lines. The expenses and value of this exhibit are said to have reached \$1,500,000. So large is the Krupp display that a special building became necessary, of which we here present a photographic view, specially taken for the SCIENTIFIC AMERICAN. The Krupp building is located just south of the great landing pier. The building is 200 ft. long, 82 ft. wide, 43 ft. high. It fronts on the lake and stands near the terminal loop of the intra-mural railway.

On this page we give a view of one of the many great things to be seen in the Krupp building, namely, one of the Krupp traveling cranes, used for slinging and moving the great Krupp guns. The massive proportions and great strength of this machine, as well as its graceful proportions and useful finish, will be evident at a glance at our engraving.

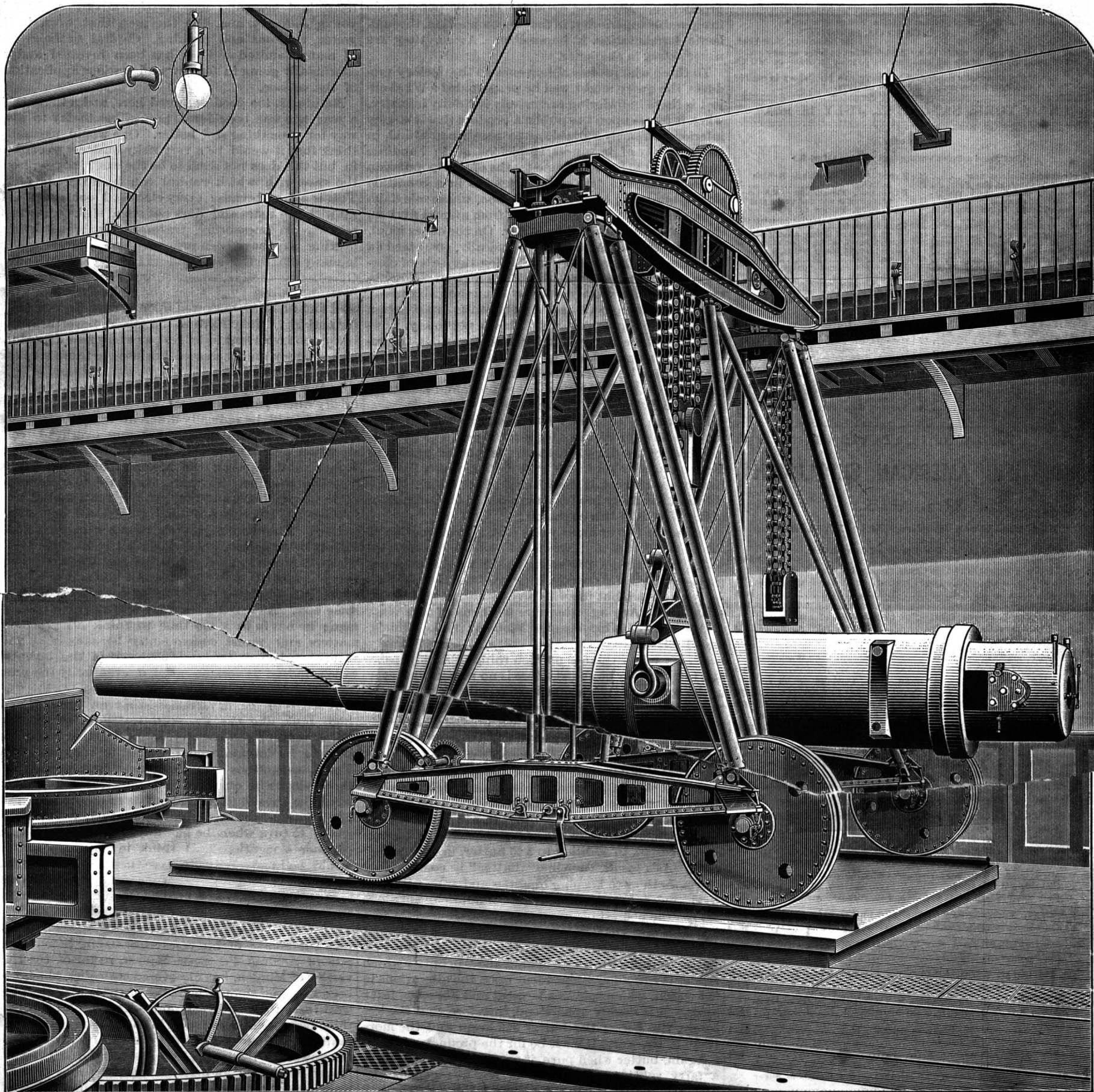
A very comprehensive description was recently given in *Engineering* of some of the principal Krupp exhibits, and we cannot do better than present extracts therefrom, which follow. First, as relating to the great guns for which the Krupp establishment is now so famous. One of them is shown in our engravings.

The largest weapon shown, and it is the heaviest piece of ordnance ever brought to an exhibition, is a 16.24 in. coast defense gun; the total length is 33.5 calibers, or 45 ft. 11 in., the length of bore being 41 ft. 8 in.; the total weight is nearly 123 tons.

This gun has fired sixteen rounds at the Krupp testing grounds at Meppen. During these trials the following results were obtained: The projectile weighed 2,200 lb., and the charge was 902 lb. of brown prismatic powder; an initial velocity of 1,981 ft. per second was recorded, and the striking energy was 18,594 metric tons. We give a photographic view of the firing of this extraordinary weapon.

The cost and trouble involved in the transport of this gun from Essen to Chicago must have been enormous. The gun was landed at the Sparrow Point works of the Maryland Steel Works near Baltimore. For the long journey from Baltimore to Chicago a railway truck was specially prepared by the Pennsylvania Railway Company. This truck forms one of the exhibits of the railway. The total weight of the car, which is carried on thirty-two wheels, is 175,000 lb., or

(Continued on page 40.)



THE WORLD'S COLUMBIAN EXPOSITION—THE KRUPP TRAVELING CRANE.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN.

A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S., Canada or Mexico.....\$3 00
 One copy, six months, for the U. S., Canada or Mexico.....1 50
 One copy, one year, to any foreign country belonging to Postal Union.....4 00
 Remit by postal or express money order, or by bank draft or check.
 MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, \$5.00 a year, for the U. S., Canada or Mexico. \$6.00 a year to foreign countries belonging to the Postal Union. Single copies, 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page.
 Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to one address in U. S., Canada or Mexico, on receipt of seven dollars. To foreign countries within Postal Union, eight dollars and fifty cents a year.

Building Edition.

THE ARCHITECTS AND BUILDERS EDITION OF THE SCIENTIFIC AMERICAN is a large and splendid illustrated periodical, issued monthly, containing floor plans, perspective views, and sheets of constructive details, pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To builders and all who contemplate building this work is invaluable. Has the largest circulation of any architectural publication in the world.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, \$2.50 a year. To foreign Postal Union countries, \$3.00 a year. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, to one address, \$5.00 a year. To foreign Postal Union countries, \$6.50 a year. Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, \$9.00 a year. To foreign Postal Union countries, \$11.00 a year.

Spanish Edition of the Scientific American.

LA AMERICA CIENTIFICA E INDUSTRIAL (Spanish trade edition of the SCIENTIFIC AMERICAN) is published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number of *La America* is profusely illustrated. It is the finest scientific, industrial trade paper printed in the Spanish language. It circulates throughout Cuba, the West Indies, Mexico Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. \$3.00 a year, post paid to any part of the world. Single copies 25 cents. See prospectus.

MUNN & CO., Publishers,

361 Broadway, New York.

The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO.

Readers are specially requested to notify the publishers in case of any failure, delay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, JULY 15, 1893.

Contents.

(Illustrated articles are marked with an asterisk.)

Agricultural devices, new.....	41	Exposition, Columbian—British building.....	36
Animals, Kansas, at the Fair.....	41	Exposition, Columbian—Krupp traveling crane and great gun.....	33
Antelope, buffalo, and prong horn.....	41	Exposition, Palace of Fisheries at the.....	35
Architect Hunt Royal Institute medal for.....	43	Foundation laying, novel.....	42
Arctic expedition, Peary's new.....	43	Goats, group of Rocky Mountain.....	41
Atmosphere, the high.....	43	Guns, Krupp, at the Exposition.....	40
Bearings, compressed air to cool.....	39	Incandescent lamp bulbs, blackening of.....	37
Book, the oldest in the world.....	42	Inventions, recently patented.....	44
Bottles in China.....	42	Ivory types.....	43
Bridge, cement and iron.....	37	Labor, Chinese, cheap.....	42
Butter, artificial.....	34	Lithography, discovery of.....	42
Calculator, a lighting.....	42	Magnetism and the human body.....	43
Car coupling, Erynn's.....	37	Malaria.....	43
Chimney cleaner, Bliss's.....	37	Moose, family of, a combat.....	41
Colorado River dam, the.....	42	Moth, the gypsy, fighting.....	38
Columbian Exposition, Kansas natural history exhibit.....	41	Paper, a new prepared.....	38
Columbus, silver statue of, Bartholdi's.....	41	Patents, the History of.....	38
Cosmetics, ancient Egyptian.....	37	Peary's expedition, the Falcon.....	43
Cough, glycerine for a.....	37	Power transmission, long distance.....	38
Cutter, the, Leni Lenepe.....	43	Railway appliances, some new.....	44
Eggs, shapes of.....	39	Seal the scoundrel.....	39
Electrical inventions, developing.....	44	Soapbuds as a lubricator.....	39
Electrical inventions, new.....	44	Swiss family life among the.....	38
Elk, a family of.....	41	Victoria House, the, Chicago.....	36
Exposition notes.....	35		

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 915.

For the Week Ending July 15, 1893.

Price 10 cents. For sale by all newsdealers.

I. CIVIL ENGINEERING.—The Canal Connecting the North Sea with the Baltic Sea.—Four large illustrations of the floating elevators.....	14615
The Swinging Bridge of Tarento.—1 engraving.....	14618
Pneumatic Conveyor Plant.—Full illustrations of machinery, made by Messrs. Samuelson & Co., Banbury, England.....	14618
II. CHEMISTRY.—Neutral Fat in Mineral Oil.—By Dr. J. KLIMONT.....	14623
Some Products of Cassava.—A paper read before the Washington Chemical Society by E. E. ELWELL and H. W. WILEY.....	14623
On the Influence of the Average Annual Temperature on the Chemical Composition of Sugar Cane.—By GUSTAVE MICHAUD.....	14629
The Chemistry and Physiology of Foliage Leaves.....	14630
Oils of Apricots, Cherries, Plums, and Peaches as Adulterants of Almond Oil.—By C. MICKO.....	14630
III. HYGIENE.—Lemons in Summer.....	14626
IV. MECHANICAL ENGINEERING.—Nau's Method of Making Metal Plates.—By JOHN B. NAU.....	14623
Hargrave's "Rising" Machine.—Full description with 3 illustrations of this interesting machine.....	14618
V. MISCELLANEOUS.—A Portrait of Columbus Attributed to Titian.—1 illustration.....	14622
The "Sap" of Trees and its Movements.—By CHARLES R. BARNES, Prof. of Botany, University of Wisconsin.....	14624
Extremes in the Vegetable Kingdom.—By G. C. NEALLEY.....	14626
Dandelions as Weeds.....	14626
California Raisin Grapes.....	14626
Pine Needles.—By J. BERTRAM and H. WALBAUM.....	14627
VI. NAVAL ENGINEERING.—The New Battle Ship Massachusetts.—Full description with 5 illustrations.....	14619
VII. PHOTOGRAPHY.—A New Tele-Photo Lens.....	14622
Metol.....	14622
VIII. PHYSICAL GEOGRAPHY.—The Formation and Deformation of Minnesota Lakes.—By C. W. HALL.....	14625
IX. SURGERY.—How to Bandage a Finger.—By S. GEO. HERMAN, M.D., Rochester, N. Y.—3 illustrations.....	14626
X. TECHNOLOGY.—Silicified Fire Bricks.....	14621
Transparent Toilet Soaps.....	14621
Enameling Papers.....	14621
Effects of Sulphur on Clarification.—By Prof. J. T. CRAWLEY.—A paper read before the regular meeting of the Louisiana Sugar Chemists' Association.....	14627
Skeletons of Man and Horse.—1 engraving.—Comparative osteology.....	14626

ARTIFICIAL BUTTER AND BUTTER SWINDLES.

With the introduction of artificial butter, oleomargarine, "butterine," etc., was instituted a rivalry—or rather a jealousy—on the part of the farming community, who feared the utter abolition of a market for their product. This fear has by no means been fulfilled. However, farming interests were able to secure legislation of an exclusive character, whereby artificial products resembling or imitating butter are obliged to be branded and labeled; and furthermore, a tax was laid thereupon which, of itself, was intended to be prohibitory.

Not satisfied with this, in some States it is even demanded that hotels, restaurants, and public institutions using artificial butter, oleomargarine, "butterine," etc., shall conspicuously place large placards announcing the fact in their dining rooms. That the law, both as to sale and advertising, is in many instances evaded must be evident. Thus these prohibitory laws work injuries to large and beneficial manufacturing interests; but, at the same time, it must be admitted that these very restrictions have, in no considerable measure, contributed to the improvement and perfection of this class of products. It is a fact that, at the present moment, so-called "butterine," or oleomargarine, can be bought on the market, which, while representing in exact chemical constituents the products of the dairy, is, at the same time, much cleaner and purer and more uniform as to quality. Artificial butters have come to stay. Already they are found on the tables of the wealthier and better classes. It is notorious that manufacturers of these products prefer them to the best butters, whether of dairy or creamery production. Moreover, artificial butters possess one insuperable superiority, in that decomposition, through lactic fermentation, is impossible. Again, they are never *salvey* in character.

To those who profess abhorrence to the factory products, the query might well be propounded: What object is there in fostering exclusively the dairy industry, when it forces upon the public a product that is largely inferior, extremely variable as to constituents, and, in the majority of instances, suspicious as to handling and making? So far as nine-tenths of the population is concerned, the butter purchased is in a condition closely bordering upon decomposition, whose sole claim to superiority is that it is derived from animal sources, through the medium of the udder. On the other hand, precisely the same product chemically, combined in the same precise proportions, under the title of oleomargarine, "butterine," artificial butter, etc., is obtained from the same source by a method absolutely cleanly and unobjectionable, without the intervention of the secreting apparatus. This is not to say, however, that there are no inferior oleomargarines, the result of working up waste, or an admixture of other fats than those of beef, and that are sold at low prices; the purchase of these, of course, is optional, and measured by the pocketbook of the purchaser.

It is also a notorious fact that the farming community, alive to the cheapness of the products simulating those of the dairy, purchase the inferior grades in large quantities and mix with butter, which they return to the market as the latter product solely. Two-thirds of the dairy product marketed in the large cities of the West is of this character.

Again, for two or more years past, a large portion of the United States, and likewise of Canada, has been invaded with agents professing to sell a chemical composition which will not alone increase the yield of butter from cream, but likewise precipitate the same from skim milk. Among other preparations of this class sold is one which has invaded Michigan, Ohio, Illinois, and Indiana, termed "black pepsin." It is simply necessary to say there is no such thing as black pepsin; and further, may be added, there is no pepsin whatever in the compound. This, as hawked about, at the extraordinary price of \$2 per ounce, possesses an absolute value of less than three cents, it being simply a preparation of salt and annatto, with a small quantity of rennet added. A mere tyro in chemistry will readily recognize that this does not increase the product of butter pure and simple, but that the increased yield obtained from the milk is due to a fat that should be entirely foreign to the dairy. In other words, this so-called "butter-increasing compound" precipitates an average of 3.64 casein, in addition to 3.55 butter, in 100 parts of milk. As a result, the final "butter" is considerably worse, both as to keeping qualities and as an article of food—judging from a standpoint of nourishment alone—than the poorest oleomargarine.

It is a fact that butter contains a small portion of casein, which is taken from the milk; but the best butter contains the least. The changes in butter which render it *rancid* are dependent upon the alterations in the casein, which acts as a ferment and liberates fatty acids. It is readily understood, therefore, that the less casein, the better the butter will keep; and the more there is, the worse it must be for the product.

Again, butter when pure, it must be remembered, is a fatty substance, made up of non-nitrogenous elements. Casein, on the contrary, is almost wholly a nitrogen-producing compound. It might be mentioned

here that while butter *absolutely* free from casein is a comparative rarity, so also cheese that is *absolutely* free from butter is equally as rare. Cheese *per se* is composed almost wholly of casein, and a compound very difficult of digestion. Butter, on the contrary, if pure, should be assimilated with the greatest ease.

An analysis of so-called *black pepsin* reveals:

Salt.....	0.83+
Annatto.....	0.15
Rennet (nearly).....	0.02

This, however, is not the only compound of the kind sold for the specific purpose mentioned. There is also hawked about a liquid which, on investigation, proves to be a very weak solution of a poor quality of muriatic acid. It would seem, under the circumstances, if prohibitory laws are to be enforced against artificial butter, products that are merely adulterated butter, or that purport to increase butter by commingling with it the casein matters of the milk, should also be made subject to severe inspection and legislation.

Developing Electrical Inventions.

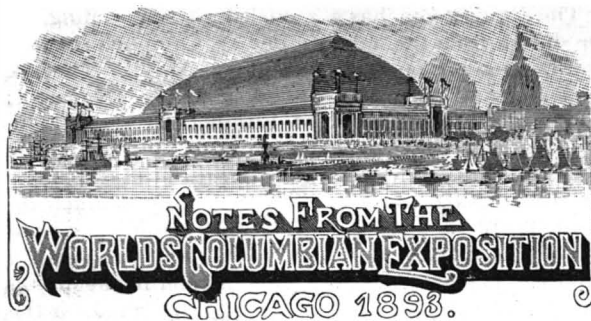
The industry of the world, whether mechanical, electrical or chemical, is based on the invention of some inventor, and may be very old or very young, as the case may be, but the great fact is nevertheless the same. The extraordinary developments that have within very few years taken place in electricity have shown the world what an inventor can do when his genius is used in the right direction and backed up with a good technical education. There is hardly any one that requires such a thorough scientific training as our electrical engineer of to-day, and this fact is recognized more and more as time advances. It is a young industry, and, like the men that work in it, young, vigorous and pushing. Capital to the extent of many hundred millions has been invested and is continually going in for new and various applications of the science.

Nothing is too good or sacred here, and a thing that a year ago was considered perfect has to-day to give way for something still better. One would naturally think that it would be a very risky business to engage in, but this does not seem to be the case, judging from the ease with which capital can be secured for it. This is a fact, because every electrical concern keeps up with the times and does not stand still. Problems relating to measuring, transforming, transmitting, heating, etc., have been presented and quickly solved in many different ways and so far very satisfactorily. Once, now and then, the inventor comes across a stubborn and intricate question, and it looks as if all the skill and patience bestowed upon it were thrown away for nothing. They have to be solved, nevertheless, it being too important to let rest, as every new departure means honor and increased business to those who are working on it.

In this category we have to class production of electricity direct; an economical way of storing it, which probably will be radically different from the present way; electric traction without any overhead construction, and a more reliable lamp, with the same or higher efficiency than the present makes for out of door illumination. They are very hard to solve, some of these problems, and they require both capital and intelligent labor if anything good shall be accomplished. There are capitalists willing to invest money in just those things, but how shall the inventor know where they are? That is another problem, and sometimes almost as hard to solve as a difficult electrical one. This obstacle ought to be done away with in some way. An engineer is very seldom also a business man; he has in fact no time to think about money matters, and must consequently be associated with some one who understands that part of the business, which indeed is very essential, if eventually the problem is successfully solved.

It seems to me, nevertheless, that an institution of high rank, like the Franklin Institute, or the electrical press of the country, could fill that part, if a popular inclination were directed in that direction. These institutions come in contact with men of just those classes in question, and the great benefit that would be a result (if carried out) is too obvious to need any arguing. An inventor would then know exactly where to turn when he has anything new in the departments mentioned. I think in any case that it would be to advantage to have the question ventilated in the electrical press, when undoubtedly several new points would come up, throwing further light on the subject.—G. Emil Hesse, in the *Electrical Age*.

IN the course of his researches among the mummy pits of Achmin, Professor Baeyer, rector of the University of Munich, has discovered cosmetics which had been in vogue among the belles of the land of Egypt at least three thousand years ago. The most notable of these beautifiers were found in the mummy case of an exalted titled personage, the Princess Aft. To enhance the power of the eye, a "brightener" had been employed containing an ingredient which seems to have been imported from far Hindostan, and its peculiar effect was to impart a verdant sheen to the iris.



The appearance of the World's Columbian Exposition on the 4th of July was most remarkable.

The number of paid admissions was 274,917, but in addition to this many thousand workmen and others who have passes went through the turnstiles, so it is safe to say that the total number of persons did not fall far short of 325,000. The crowd began to come at four in the morning. The gates were open to all comers at seven, and at seven-thirty there was a crowd at every gate. Cable cars, elevated, the Illinois Central and excursion trains poured in a solid crowd all day. The ticket sellers and turnstile men were powerless to prevent the congestion at some of the principal gates. In many cases it required half an hour to enter the grounds, but once inside there was room for all, and the people scattered among the buildings according to their individual taste. The grounds are closed at 11 o'clock at night, but the attractions were so many, and the crowd so great, that it was nearly one o'clock before the last remnant of the day's attendance had disappeared.

The first part exercises took place about midday in front of the Administration building, where a temporary platform has been erected. The programme was simple. Appropriate addresses were delivered by Mr. J. S. Norton, Vice President Stevenson, Mayor Harrison, and by Mr. H. L. Carson, of Philadelphia. An enormous concourse of people attended, the plaza facing the platform being crowded to its limits. While these exercises were being held, the day was being commemorated in Midway Plaisance in a manner most picturesque.

At noon representatives of the various concessions began to gather at the west end of the Plaisance. Many Bedouins dressed in their highly colored native costumes, and mounted on camels or spirited horses, seemed to take the lead. A large number of Turks with the Turkish and American colors intermingled followed after. The people from the Cairo street were fully represented in their native gala day dress. The actors, jugglers, and other people connected with the Chinese theater appeared in their richest robes. Natives from the Dahomey village and the Lapland village joined in the procession. By no means the least conspicuous feature in the gathering was a band of Pottawatomie Indians. All these and many others formed the center of a gathering of over 25,000 most curious-looking people that had gathered to commemorate the day. At a given signal the American flag was unfurled from a lofty pole, and in an instant there was a din of cheers and shouting from the assembled multitude, a salute from the British artillery, and a mixture of noises from fifes, tomtoms and a great variety of musical instruments from all parts of the world. As soon as silence once again reigned, the Mohammedan priest of the Plaisance, in his bright ecclesiastical raiment, offered prayer. The address at these exercises was delivered by Commissioner Burton. These exercises were carried out by the foreigners connected with the Plaisance, and Americans were interested in them only as spectators.

In addition to these special exercises, each concession observed the day in its own peculiar way. The German village was festooned with oak leaves. The Samoans sang "America" in their native tongue at the South Sea Island theater. The natives of the Javanese village bedecked themselves with American flags. The Chinese theater exhibited a flag upon which was written the Declaration of Independence in Chinese characters. The natives of the Dahomey village wore flags over their shoulders, and the American flag was conspicuous in the Street of Cairo, while in other concessions there was some special feature commemorative of the day. The Ferris wheel was decorated with bunting, and a brass band was stationed in one of the cars during the afternoon and evening, playing patriotic airs. This great wheel presented a magnificent sight at night, as the cars were illuminated and red fire burned at intervals, while the powerful rays of an enormous search light on the roof of the Manufactures and Liberal Arts building were thrown

upon it, bringing out in strong relief against the darkness the enormous proportions of the structure.

Elsewhere in the grounds the day was fittingly observed. In the Delaware building exercises were held in connection with the new Liberty bell, which, unfortunately, was not cast in time to be present, but it was rung in the bell foundry in Troy, N. Y., where it was cast. A signal was sent by the Western Union Telegraph Co. from the Exposition grounds to the foundry.

The original American flag floated by Paul Jones was run up at the exercises held in front of the Administration building, and was also a feature at the exercises in the Delaware building. At the close of the exercises the people marched over to the Pennsylvania building, and this original flag was there spread over the original Liberty bell, which forms a part of the Pennsylvania exhibit. No event of the day seemed so much to touch the hearts of the people as this incident in the Pennsylvania building.

Appropriate exercises were held in the New York State building, and in the evening this building was brightly illuminated. Special observance of the day was also made in the buildings of Ohio, Illinois, Washington, California, Michigan, Wisconsin, Indiana, Colorado, and other States.

In the evening a grand display of fireworks was given from floats on the lake opposite the broad open space before the Manufactures Palace. This entire space, from the model battleship Illinois to Music Hall at the Peristyle, a distance of half a mile, was a mass of surging humanity. It was one of the finest pyrotechnic displays ever seen in Chicago. It began with a balloon, which sailed from the top of the Manufactures and Liberal Arts building out over the lake with what appeared to be a ball of fire hanging from

are driving along the ground to a place in the interior where they are killed. Almost every country in the world sends samples of the boats and the vast variety of appliances used to catch fish, besides pictures of fishing scenes and an infinite number of fish products. Norway is to the front in fisheries. In the exhibit of that country are models of the boats and the weapons used in assailing the walrus, the seal, and the polar bear. The Lofoden fisheries are especially well illustrated. No fewer than 30,000 men, with between 7,000 and 8,000 boats, come annually to fish for cod at the Lofoden Islands. Strange to say that among so many men there is no crime or disorder of any kind. Thirty million cod are taken each year. Gloucester, the American Lofoden, is nobly represented. A large model of the harbor shows warehouses and the fish docks with all the usual accessories. That great fishing center has now 400 schooners, of about 81 tons burden each. There is an interesting model of a fishing scene in Boston Bay. The water on which the boats float is well counterfeited. Down in the depths the nets may be seen, and on the floor of the bay there are the fragments of wrecks, the debris of a roadstead, and marine plants peculiar to the locality.

In the same building are models of whales, sharks, devil fish, mammoth lobsters, sword fish, sturgeon, etc. A novel way of advertising a fish glue may here be observed. Two pieces of belting, glued together, suspend an old rusty cannon taken from a British frigate that had been sunk in the St. Lawrence nearly two centuries ago. To add interest and variety to this part of the show there are introduced eel traps, lobster pots, machines which automatically remove the scales from fish, and a model of the menhaden fisheries which illustrates how these little fish are captured in nets,

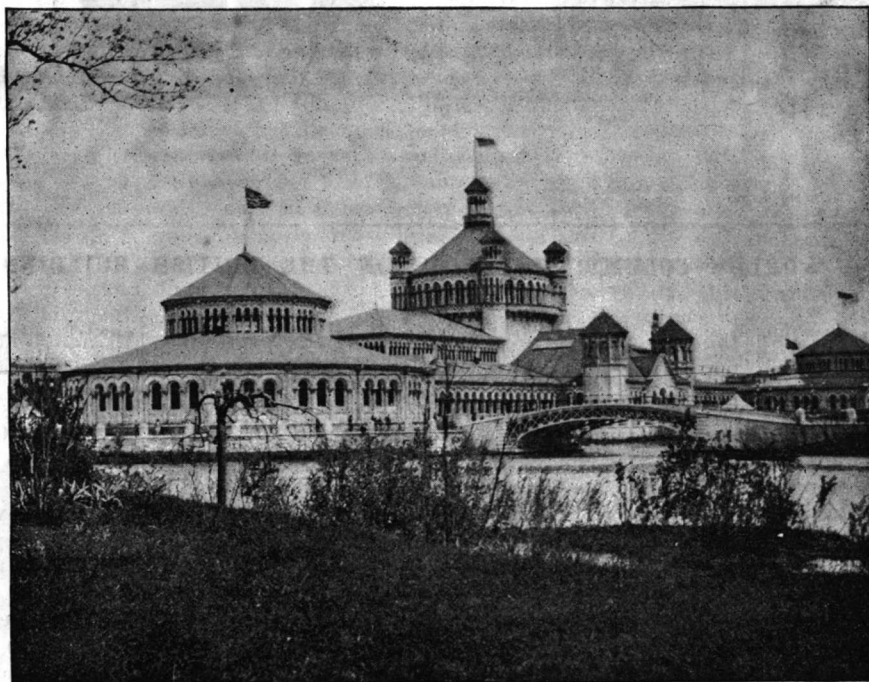
loaded in bulk in the holds of vessels, discharged like grain by means of elevators, and in brief the whole method of "handling" these profitable products of the deep. It is needless to say that in the department dealing with angling there is no other country in the world but America that could make an exhibit of anything like equal merit. Everywhere one turns, models are seen which compel admiration on account of the novelty, ingenuity, and evident efficiency of the various angling contrivances which originate in this country, are first employed here, and soon find their way to every civilized land where fish forms part of the natural resources. There is an American-made sportsman's canoe which invites attention. It is very strong and stable; it can carry three men with perfect safety; and yet it weighs only fifty-seven pounds.

No one can doubt the popularity of the aquarium in the Fisheries building. From the time that visitors are permitted to enter in the morning until late at night the corridors are crowded. Not only does every one seem to be pleased, but, without exception, all visitors appear to banish

whatever might distract the attention from the instructive, beautiful, or curious exhibits. Those who have lived all their lives remote from the sea are anxious to make an acquaintance with living specimens of such fish as they have read about or have eaten with more or less satisfaction. On the other hand, the visitor who has had the music of the salt sea waves in his ears, and who has had the misfortune to be acquainted with streams and lakes that had been depleted utterly of their finny inhabitants, are just as curious to know all that can be known of the fresh water fish. It cost about \$20,000 to place the fresh water varieties on exhibition, and at least \$10,000 to perform the same service for the public with the denizens of the ocean. There is a hospital attached to the aquarium. There Dr. S. P. Bartlett, of Quincy, Illinois, ministers to such as disease has marked. Funus gives him a good deal of trouble. It is just as contagious as smallpox, and only the most careful measures can save the victims or prevent them being the means of communicating the fatal growths to their healthy neighbors. The favorite remedy is to bathe the parts affected with a solution of carbolic acid. Notwithstanding all the care, the mortality from this ailment is considerable, being estimated at one-half of one per cent a day. To keep the water in a healthy condition all foreign matter is carefully removed, and fresh air is introduced by a system of pipes laid along the bottom of the tanks.

Sometimes Dr. Bartlett gives an exhibition of the tameness and playfulness of brook trout. He twirls his index finger in the water, and the fish rise in a body to make a rush at the finger and attempt to bite it, pushing one another aside without ceremony in their eagerness to reach the object of attraction. Lake trout are surprisingly fearless. They permit them-

(Continued on page 33.)



THE PALACE OF FISHERIES.

it. When over the heads of the multitude, this ball of fire burst and there was spread out to view an American flag, with all of its stars and stripes and colors. The success of this display was greeted with great enthusiasm by the spectators. The set piece of the evening was a portrait of Washington wreathed in laurel and adjoining the words "The first in war, the first in peace, the first in the hearts of his countrymen."

Sunday, July 2, was observed at the Exposition as Patriotic Sunday. The exercises were largely attended by representatives of the army and navy, both retired and active, and many foreigners, connected with the Exposition in one capacity or another, were present. In one part of the exercises a bugler sounded the call "Taps," and, as the strains of the call died away, two sailors removed a large American flag which hung in the rear of the platform. The removal of this flag displayed the American naval colors, across the banner being inscribed the words "In Memoriam H. M. S. Victoria." One of the sailors placed a laurel wreath on the colors. The incident was carried out with such tenderness that tears came to the eyes of nearly everybody in the audience who recalled the tragic death of the crew of this British vessel.

In the main portion of the Fisheries building specimens of most of those things which industry and science have brought from lake, river, and sea are shown. Very interesting also is the exhibit of the United States Fish Commission, which gives a clear idea of the methods employed by it in deep sea work and in propagating fish to stock rivers and lakes. There is a large model of the seal fisheries at Alaska, etc. Professor Elliott, of the Smithsonian, the greatest authority in the world on seal life, superintended the construction of the models. One shows a "drive," and includes hundreds of mimic seals which the natives

THE VICTORIA HOUSE, CHICAGO.

ROBERT W. EDIS, F.S.A., ARCHITECT.

We present a photographic plate of the British building, or Victoria House, at the great Fair, specially taken for the SCIENTIFIC AMERICAN, and to the *British Architect* we are indebted for our interior view and the following particulars:

This building forms the official headquarters of the Royal British Commission. In this building Colonel Edis, the architect, has happily embodied the picturesque qualities of an Elizabethan house, both inside and out, though the comforts and convenience which it boasts will perhaps impart considerably more satisfaction to the occupants than any of its artistic qualities. The comforts which Her Britannic Majesty's Commission may enjoy in this Victoria House are certainly in striking contrast to those which a nobleman enjoyed in the times of good Queen Bess, when "blessed with a large family and a retinue of 150 servants, he was content with but one large table and three long benches, as sole furniture for his great apartment of state."

Messrs. Johnstone, Norman & Co. have carried out the decoration and furnishing of the Victoria House, and it will be evident no effort has been wanting to make the British Commission offices worthy of their important function at the World's Columbian Exposition.

The modeled plaster ceiling of the hall is copied from a ceiling in that well-known example of old work in Wales, Plas Mawr, Conway. The ceiling over the staircase and principal landing of the hall is after an old example at Haddon Hall. The furniture herein is after the Italian Renaissance, and facing the entrance is a cassone, reproduced from an old Florentine example in the Royal Palace at Naples, enriched with carving (in parts solid gilt), and a painted frontal panel, with gilded ground, representing the "Departure of Columbus from Spain," by F. Hamilton Jackson. A large arm-chair near displays in sculptured relief the discovery of America. The companion fauteuil, rendered in Francois Premier, is of that old kind known as "Caqueteuse," i. e., cackle or gossip chair. Other furniture includes two fine old settles, copied from examples in the Pitti Palace at Florence. The tables were suggested by one in the Museum at Exeter. Two pedestaled knights in armor stand near the stairway, and the hall also contains an interesting specimen of a chiming "grandfather" clock.

In the reception room the modeled plaster ceiling is

reproduced after the banqueting hall of Crewe Hall, and forms a counterpart of one used by Colonel Edis in building the ball-room at Sandringham for the Prince of Wales. In the furnishing of this fine reception room are included four beautiful cabinets, one an adaptation of Archbishop Sharpe's, a well-known example of "moulded cabinet work;" another copied from an old Scotch "aumrie" (French "armoire"), time James I., after one in the possession of the Bass family at Burton-on-Trent; the third, a richly carved example after a kind of Flemish design in the Cluny Museum; and the fourth, a walnut cabinet on cabriole legs after a Dutch design, a very fine example of mar-

The dining-room has a modeled plaster ceiling, reproduced from the famous one at Campden House, the London residence of the Duke of Argyll. The oak paneling and furniture are of a simple treatment, suited to a modern room of Elizabethan style. The embossed leather, which is a noticeable feature on the walls here, as on the grand staircase and elsewhere, is one of the good things for which we are so much indebted to Messrs. Jeffrey & Co., of Islington, whose wall paper designs have been used throughout the Victoria House. The pattern of embossed leather in the dining room is the same as that specially designed for the Prince of Wales' ball-room at Sandringham for Col. Edis.

The Commissioners' room is a handsome apartment on the first floor, for use of the members of the Royal Commission, and serves the uses of a club and a business room. The furniture is of oak of antique character, designed by Mr. Owen W. Davis.

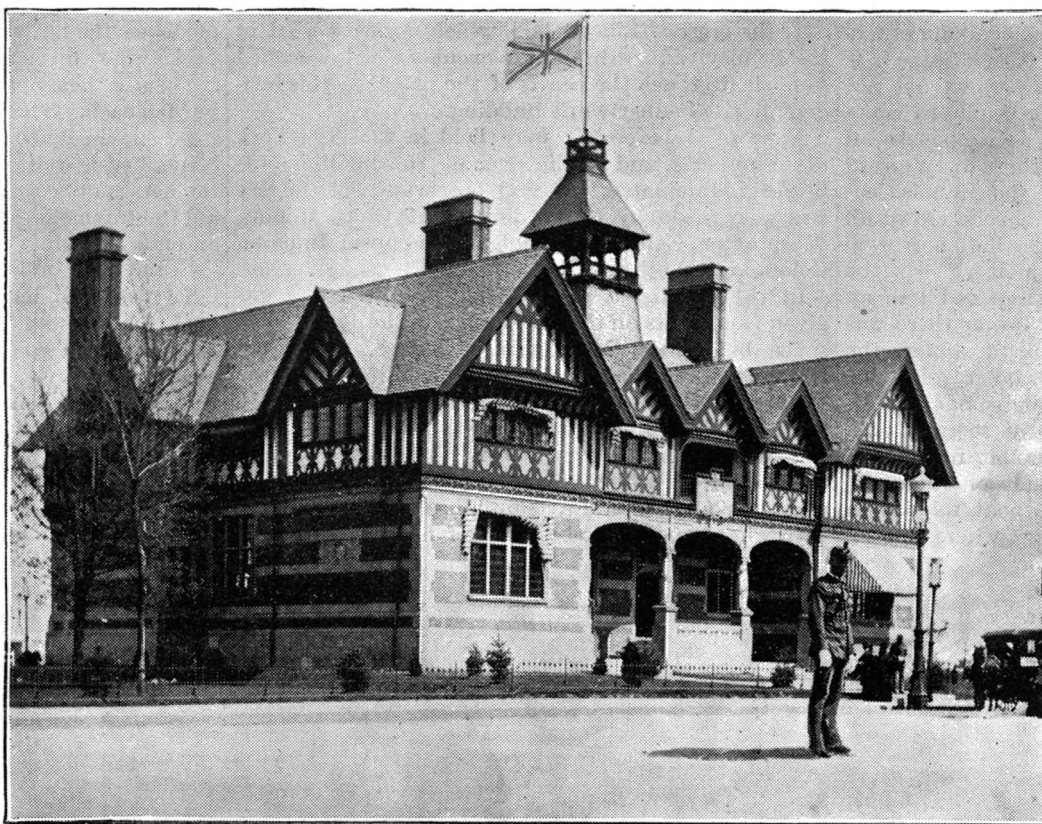
For the carpets throughout the building hand-woven Axminster have been chosen from the Royal Carpet Works, at Wilton, near Salisbury, by Messrs. Yates & Co. The stoves, fenders and fireplace fittings were designed and executed by Feetham & Co., of Clifford Street. The iron backs to the hall stoves with the royal arms are replicas of one designed for the state vestibule of Windsor Castle, by Messrs. Johnstone, Norman & Co., in 1887.

The three beautiful stained glass windows on the grand staircase were specially designed and executed by Messrs. Campbell, Smith & Co., without whose admirable productions it appears no English exhibition would be complete.

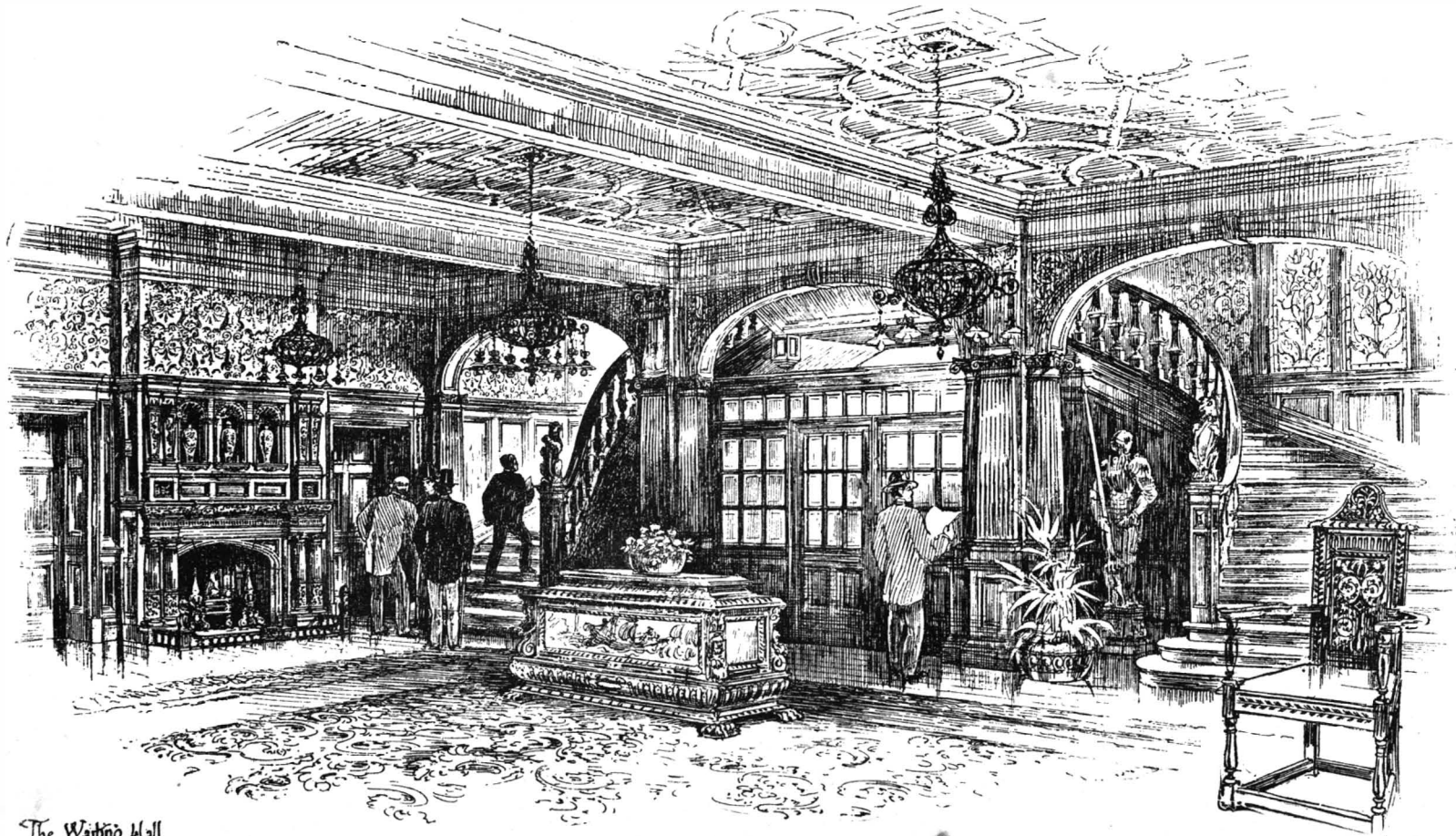
The very cleverly treated electric fittings are by Starkie, Gardner & Co., who also made the locks and hinges of wrought and polished iron largely after old examples.

We are indebted for some particulars of our description to Mr. C. Eyre Pascoe's dainty little souvenir of the Victoria House.

CONTRARY to the opinion of very eminent geologists, Prof. Bonney contends that glaciers exert no excavating action, and this conclusion he bases on facts observed by him in the Swiss Alps. He had followed up many of the valleys in Switzerland, and the work of the glaciers in every instance should, he believes, be classed rather as abrasive than erosive. In the absence, however, of the erosive theory, it will be difficult to account for the present character of many of the lochs on the west coast and in the interior of Scotland.



THE WORLD'S COLUMBIAN EXPOSITION—THE BRITISH BUILDING.



The Waiting Hall

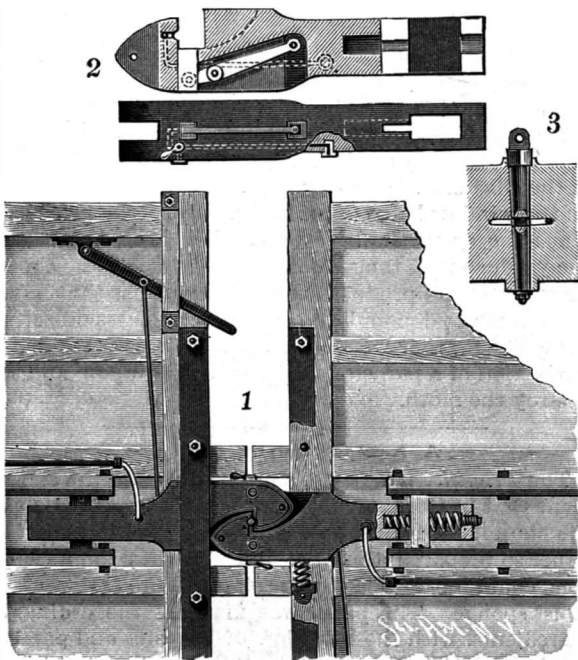
THE WORLD'S COLUMBIAN EXPOSITION—INTERIOR OF THE BRITISH BUILDING.

Combination Cement and Iron Bridge.

A new bridge was recently completed over the River Neutra, in Hungary, according to a system devised by Robert Wunsch, and consists of beton arches in which iron skeleton framework has been incorporated. The iron work comprises not simply single iron rods, but complete trusses made up of horizontal upper and parabolic lower chords. Cross girders and tie rods, however, have been entirely omitted and are supplanted by the beton. The wooden false work of the bridge was built to form a series of moulds, each mould constituting one complete bridge arch, and after the iron work had been put in place the beton was dumped in and thoroughly rammed. The work was divided up, so that the beton filling of each arch was completed in one day, and the false work was kept in place for an average of 37 days for each arch. The bridge piers also consist of beton. There are, in all, six arches. The total length of the bridge is 377½ feet and the width 19.7 feet. The whole work of construction was completed in four months, including the time consumed in driving piles for the pier foundations.

AN IMPROVED CAR COUPLING.

This coupling is so secured to the cars as to prevent its pulling out, and its interlocking jaws render the telescoping of the cars impossible. The improvement has been patented by Mr. Robert N. Ervin, of Cleburne, Texas, a locomotive engineer of twelve years' experience, and at present an employe of the G. C. & S. F. R.R. Fig. 1 shows the application of the device in a bottom plan view of the meeting ends of two cars coupled, Fig. 2 being a horizontal section and side elevation of a drawhead. Each drawhead has its hooked nose transversely recessed to receive a tongue of an adjacent coupling, preventing vertical displacement, and is adapted to receive the link of an ordinary link and pin coupling, for which a pin hole is provided. Each drawhead has an interior passage, the inner end of which has a nipple to receive the coupling device of the train pipe of an air brake system, while its outer end opens into a vertical tapering socket in the interlocking face of the hook, such faces, when engaged, forming a seat for a plug, as shown in Fig. 3, having a straightway port to make the passages continuous from car to car. The plug preferably has a metal core, surrounded by a rubber jacket or packing, and an eye by which it may be chained to the car. The shank of the drawbar is shorter than usual, and side bars, between which the drawhead is loosely secured, are bolted to the draw timbers or sills, springs being interposed on either side of the pin or key. The drawheads are close up to the dead-blocks or bumpers, so that the force of meeting cars will be largely expended on the bumpers. Only a small portion of the rear end of the drawbar is confined between the draught timbers, thus allowing the body of the car to move from one side to the other in rounding curves, while the jaws of the drawhead remain rigid, and are subjected to a straight pull all the time. For uncoupling, a push piece is arranged in a transverse cavity of the drawhead, and jointed to a lever connected by a rod with a hand lever at the side of the car. This lever may be placed in such position as the construction of the car may render convenient. It is impossible for the coupling to part

**ERVIN'S CAR COUPLING.**

by one car dropping lower than the other, and with this coupling all danger to trainmen in coupling and uncoupling is avoided.

Glycerine for a Cough.

In severe paroxysms of coughing, from whatever cause, a tablespoonful of glycerine in hot milk or cream will give speedy relief.—*Annals of Hygiene; Med. Rec.*

THE SILVER STATUE OF COLUMBUS.

Among the more remarkable exhibits at the World's Columbian Exposition is the silver statue of Columbus, which pertains to the splendid exhibits made by the Gorham Company.

The statue depicts the hero in his most important role. The figure is designed and modeled by Bartholdi, the contemporary French sculptor, who is so well and favorably known to the American people from the statue of "Liberty Enlightening the World."

As a work of art, this statue has been pronounced by

**BARTHOLDI'S SILVER STATUE OF COLUMBUS.**

connoisseurs to be a masterpiece. Life and vigor are implied in every line and feature, and the general effect is one of great beauty. Combined with this fact is the significance as being probably the largest figure ever cast in silver and the success attendant upon its conception and production. The statue is somewhat more than life size, being slightly over six feet in height and standing on a silver pedestal about a foot high. Thirty thousand ounces of sterling silver, 925-1,000 pure, was used in the casting. The finish is such as best to preserve the whole vigor and spirit of the sculptor's model rather than as a specimen of the chaser's art. The metal is finished in the oxidized form, thus allowing much more expression in light and shade effects than as though highly polished. The latter style of finish would give simply a colorless, lifeless picture, unrelieved by darker tints.

The process of casting was not essentially different from the ordinary mode of procedure in bronze, except that more care was taken in the details. The sculptor first made in clay his complete model exactly as it is to appear in the finished statue. Then a mould was taken of the model by applying a heavy layer of plaster of Paris. The plaster mould was then removed in arched sections, so that being removed they could be placed together so as to form a complete figure with the outlines on the interior. From this mould a plaster of Paris cast was made, thus reproducing in plaster the identical figure first modeled in clay. The plaster cast, covered first with a coating of shellac to prevent the absorption of moisture, was then ready for the founder, and in this form was shipped from the studio of the sculptor at Paris to the works of the Gorham Company at Providence, R. I.

At the foundry the plaster cast was first put on a soft bed of sand and covered with a layer of moulder's sand shaped into arched sections, as was the plaster mould, and a sand mould thus formed which could be taken off the cast and put together again. An outside frame of sand, beaten hard over the sections, served to keep the layer intact. After this step was completed, the sections were removed and a coating of liquid plumbago or black lead applied to the inner surfaces. The moulder's, or French sand, is of a peculiar nature, containing the qualities of a pliable clay and a coarse sand, which will allow, by its porous composition, the escape of gases generated in the interior. The lead-coated sections, after being put together, were secured by perforated iron pipes running through the figure in all directions, like a venous system. A second cast was then made from the second mould by packing the mould full of sand mixed with a flour

paste, so that the particles of sand will cohere; the sand model being held together and in place by the iron pipes which traversed the interior of the mould.

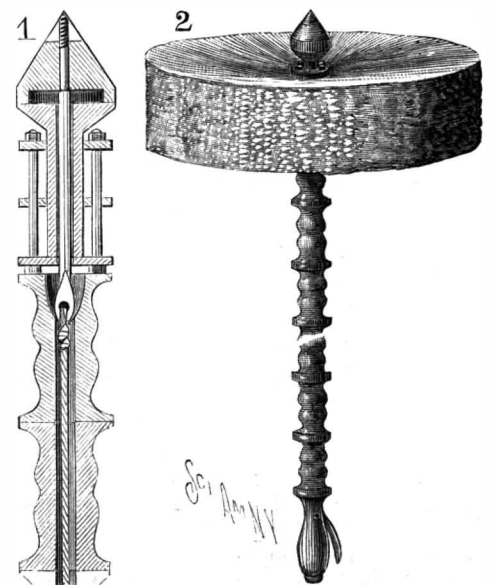
Again the sections of the sand mould were removed, the plumbago still adhering and remaining on the interior surface. The sand model or core, bared from the outside shell, was then shaved down to a depth corresponding to the thickness of metal in which the statue was to be cast, and then painted with a layer of plumbago as the interior of the shell or mould. Both shell and core were then ready for the oven, and after being subjected to a three days' bake they were dry enough for the operation of pouring. Then the sand shell was built up again over the core, and the whole fastened and held together by an iron frame. Thus the final mould for the casting consisted of the space bounded on the outside by the sand mould, giving the exact outlines of the original plaster and clay models, and on the inside by the sand core, which has been reduced in all parts, corresponding to the depth of metal to be cast. The entire mould was then covered with a heavy outside coating of sand through which channels are cut leading to all parts of the interior space. These channels are for the purpose of causing an even and rapid distribution of metal, and extend from the top or mouth of the mould where the metal is poured, through the outside layer in tortuous pipe-shaped passages to the various parts of the mould.

Four black lead crucibles containing the ton and a quarter of precious metal were placed in the furnaces after the completion of the final mould. After about four hours the molten contents of the crucibles were at a white heat and all was in readiness. One by one each crucible was lifted by a chain fall and the contents poured into a large iron bucket and thence to the huge mould buried in sand. After a few hours the casing was sufficiently cool to allow the removal of parts of it; enough to show, to experienced eyes, that the casting was practically perfect.

Thus was brought forth in almost heroic size the picture in silver of Christopher Columbus; a masterpiece of the great sculptor and a perfect exemplification of the ability of the founders to successfully overcome the difficulty of casting a life-size figure in solid silver.

A FLUE AND CHIMNEY CLEANER.

This is a simple and inexpensive device which may be readily passed into and through a chimney or flue, to clean it, its flexibly connected handle sections conforming to the shape of the flue, so that it may be introduced from a room and moved upward or downward as desired. Fig. 1 is a longitudinal section and Fig. 2 a perspective view of the device, which has been patented by Mr. William H. Bliss, of Kansas City, Mo. (Station A.) The brush section has a central eye bolt on the outer end of which is a conical cap and lock nut, the eye bolt being surrounded by a tube and three or more disks, the latter forming clamps between which the brush material is held, and the disks being drawn together by bolts provided with suitable lock nuts as shown in Fig. 1. A cord attached to the eye of the eye bolt of the brush section extends through handle sections of spool-like form, the number of sections employed varying with the length or height of the flue or chimney to be cleaned, the other end of the cord being knotted or attached to a nut on the outer

**BLISS' FLUE AND CHIMNEY CLEANER.**

end of the last section. The latter section also has a side recess in which is pivoted a cam adapted to engage the cord to hold it taut after the different sections have been put in place. In introducing the brush into a chimney or flue, the spool sections are added until the brush section has been forced practically through, when the outer handle section is added and the cord tightened, after which the cleaner is moved in or out as deemed necessary.

WORLD'S FAIR NOTES.

(Continued from page 35.)

selves to be fondled very freely and do not appear to dread any harm, even when the hand is thrust in among them with some violence. Rare beef and sea lettuce are much relished by fiddler crabs. The human-like action of the claws displayed by these animals when selecting certain morsels and conveying them to the mouth is at first very interesting to note, and a strange impression is produced when an identity of process in effecting the same end is observable in creatures so far removed in the scale of creation as a human being and a crab. Visitors make, apparently, an endless number of discoveries for themselves in their inspection of the tanks. No one leaves with an appearance of weariness, and many persons can be seen day after day, whatever other attractions there may be elsewhere, hastening to have a glimpse, however brief, at the contents of the aquarium.

The Scenic theater, which has a seating capacity of one hundred, is lighted and cooled by electricity, and the performance is entirely electrical. The performance is called "A Day in the Alps." A perfect Swiss view is shown, with snow-covered peaks and valleys, while in the foreground are pleasant Swiss chalets. The opening scene is just before daybreak; after a faint glimmering of stars the sun begins to gild the snow-capped peaks, the mist is dispelled, and you can hear in the distance the peasants singing the "Jodel." A storm then comes up. This is a very realistic performance—thunder, lightning, and rain follow each other in quick succession. The sunset follows with the never-to-be forgotten after-glow, the moon comes creeping up behind Mont Blanc, and the stars shine brightly. The effects are very wonderful, and the audiences are delighted.

The second spun glass dress ever made is now the property of the Infanta Eulalia, the first being made for an actress. The glass was spun at the great Exposition in the Libbey building in the Midway Plaisance. From a glass cylinder half an inch in diameter and a yard in length, over 12,000,000 feet of filmy thread was spun, and this, it is said, was woven into twelve yards of material, which was made up into a dress for the Infanta by a New York modiste. The wheel on which the glass was reeled is 18 feet in diameter, and revolves 350 times per minute, or at the rate of about 70 miles per hour. The extremity of the glass rod, from which the thread is drawn, is heated to a high degree, so as to melt the glass, which is then drawn out by the wheel into a fine thread and wound on the periphery of the wheel as fast as it is formed. The fabric looks like heavy white satin, but has a most beautiful sheen. Such dresses may do to look at, if kept in a glass case, but their use would be rather dangerous, owing to the small bits of fine glass that break off in handling, and are likely to float in the air and enter the eyes and nose.

The Blackening of Incandescent Lamp Bulbs.

A recent paragraph in the *Digest*, referring to one of the theories of the blackening of lamp bulbs, namely, that it is due to the evaporation of carbon, recalls a paper by Prof. Elihu Thomson, published in a recent number of the *Lehigh Quarterly*, which shows that he has held this view for many years, his experience since then having tended to confirm his views. The paper is entitled "The Life of Incandescent Lamps," and contains a number of points of interest, some of which may not be generally known.

In answer to the question, Can a filament be made which will not deteriorate and therefore not blacken the interior of the bulb? he is inclined to think that it cannot, if carbon is adhered to, and carbon as yet seems to be the best material in existence; it is so on account of its infusibility and its apparent volatility. It actually does soften at extremely high temperatures, and will bend readily when so softened. It does not melt at the highest known temperature, but it readily vaporizes in the arc lamp. It is very probable that carbon, infusible as it seems, could be fused at arc temperatures while under pressure. Thus, an electric arc in an inert gas at high pressure would probably drip melted carbon, which would form graphite in masses or crystals.

The deterioration of incandescent lamps has often been laid to the bombardment of gas molecules, but Prof. Thomson has long been convinced that in a well exhausted lamp it is due almost entirely to evaporation by high temperature. Just as ice evaporates in vacuo, so carbon acquires in vacuo a certain volatility at an increasing rate of the temperature. He assumes, of course, that the vacuum is so good that none of the bluing or visible discharge of current takes place, which of course wears the filament by actual carriage of carbon. He thinks that it would be very strange if carbon maintained at so high a temperature in a vacuum did not evaporate at all, as it is well known that almost all substances raised to a sufficiently high temperature do give off insensible vapors, and that melted metals frequently behave as mercury does at the ordinary temperature; the presence of foreign substances and gases will in some

instances accelerate the action or perhaps in other cases retard it. In a lamp a certain evaporation takes place which is independent of the size of the bulb, from which it follows that the age coating will become much less as the bulb is greater in size, for the same deposit will yield a much thinner coating of carbon over a large surface than over a small one. If one lamp were made with the smallest possible bulb and another with a large bulb, the former might be rendered opaque, while the latter would only be slightly darkened, other conditions being the same. He puts great stress on the uniformity of the filament, and gives the reasons. It appears to be true, he says, that the limit of practical improvement in the efficiency of incandescent lamps is to be found in the properties of the element carbon, and particularly its volatility. It is fairly safe to say that no other less volatile substance has yet been found, and that carbon, as pure and perfect in structure as possible, is likely to hold its place, at least for some time to come, as the material for incandescent lamp filaments.

Family Life Among the Tibetans.

Some very interesting sketches have been given in *Leisure Hour* by Miss Isabella Bishop, descriptive of her journeyings in Tibet, that inaccessible and rarely visited corner of Asia.

Family life, she says, presents some curious features. In the disposal in marriage of a girl, her eldest brother has more "say" than the parents. The eldest son brings home the bride to his father's house, but at a given age the old people are "shelved," i. e., they retire to a small house, which may be termed a "jointure house," and the eldest son assumes the patrimony and the rule of affairs. I have not met with a similar custom anywhere in the East. It is difficult to speak of Tibetan life, with all its affection and jollity, as "family life" for Buddhism, which enjoins monastic life, and usually celibacy along with it, on eleven thousand out of a total population of a hundred and twenty thousand, farther restrains the increase of population within the limits of sustenance by inculcating and rigidly upholding the system of polyandry, permitting marriage only to the eldest son, the heir of the land, while the bride accepts all his brothers as inferior or subordinate husbands, thus attaching the whole family to the soil and family roof-tree, the children being regarded legally as the property of the eldest son, who is addressed by them as "Big Father," his brothers receiving the title of "Little Father."

The resolute determination, on economic as well as religious grounds, not to abandon this ancient custom, is the most formidable obstacle in the way of the reception of Christianity by the Tibetans. The women cling to it. They say, "We have three or four men to help us instead of one," and sneer at the dullness and monotony of European monogamous life! A woman said to me, "If I had only one husband, and he died, I should be a widow; if I have two or three, I am never a widow!" The word "widow" is with them a term of reproach, and is applied abusively to animals and men. Children are brought up to be very obedient to fathers and mother, and to take great care of little ones and cattle. Parental affection is strong. Husbands and wives beat each other, but separation usually follows a violent outbreak of this kind.

It is the custom for the men and women of a village to assemble when a bride enters the house of her husbands, each of them presenting her with three rupees. The Tibetan wife, far from spending these gifts on personal adornment, looks ahead, contemplating possible contingencies, and immediately hires a field, the produce of which is her own, and which accumulates year after year in a separate granary, so that she may not be portionless in case she leaves her husband!

THE long distance transmission plant of the San Antonio Light and Power Company, Pomona, Cal., has now been in successful operation for the past six months, transmitting a distance of twenty-eight miles. The hydraulic part of this plant, the *Electrical Engineer* says, was installed by the Pelton Water Wheel Company, and one of the principal attributes to the successful operation of the plant is their new regulating apparatus, which, it is stated, controls the speed of the wheel perfectly under the most exacting conditions as to variation in load on the generators.

With this new system of regulation which has been developed by this company, the successful operation of any plant which they install is now assured. The regulating appliances heretofore used in connection with water power plants gave but indifferent results.

Perhaps the most severe test that a water wheel governor was ever subjected to is in the case of a Pelton wheel running a set of circular saws at the mill of the Red Cross Lumber Company, in the northern part of California. The wheel is operated under a vertical pressure of 485 feet. The saws require to drive them through the log at full feed 125 H. P. They take about seven cuts per minute, thus varying from full load, namely, 125 H. P., to only what is required to drive the saws running free. During this operation the variation in speed is not perceptible.

One of the most valuable features of the regulator is that it is positive in movement, and there is no danger whatever of its racing, thus admitting of its being geared so as to be extremely sensitive and to meet the requirements of electric railroad work, in which the changes are tremendous.

Magnetism is Without Effect on the Human Body.

Mr. A. E. Kennelly, of the Edison laboratory, and Dr. Frederick Peterson, of the College of Physicians and Surgeons, have reported to the American Electro-Therapeutic Association the result of their experiments on the effect of magnets on the human body. Experiments were tried on cats, frogs, boys, and themselves. Human and frogs' blood failed to show any traces of polarization, movement, or vibration. In the case of live frogs, no influence of the magnet on the blood cells or the movement of the blood could be found.

To test the German theorists' claims that magnetism increases the resistance to conduction in motor nerves and causes paralysis, a small dog was placed in a cylinder between large field magnets and kept there for five hours under the influence of a strong magnetic current. The exposure seemed to have no effect on the dog, and he came out as lively as he went in. Then a boy was placed between the magnets and a magnetic current was turned on. There was no effect upon the boy. The magnetic current was strong enough to balance a heavy bolt in the air and to contract wires of iron and to hold iron chains so strongly that it required the efforts of several men to detach them. Then the experimenters themselves and their men took turns in lying down on a board placed between the poles of a huge magnet with the current alternately turned on and off. One observer would hold the wrists of the subject and take sphygmographic tracings of the pulse. The second observer would observe the respiration, and the operator would turn the current on and off. No changes were observed in the tracings, or in the respiration, or in any other way. One subject held a steel screw in his hands, while he could tell from its attraction whether the current was on in the magnets. He had no sensations of any other kind. The observers concluded that the human organism is in no manner affected by the most powerful magnets known, and that the brain and the nerves get no sensations or impulses from the magnets. They say that it may be possible that some day magnets may be invented where the number of reversals to the second is high enough and the force strong enough to produce effects on the nervous system, but that so far as the experiments show, electromagnetism seems to have no influence whatever on the human body.

Fighting the Gypsy Moth.

The Massachusetts Agricultural Society employs one hundred men in fighting the gypsy moth. Each man has charge of a district about a mile square. Whenever moth clusters and nests are found, they are collected by the wagon load and burned. Paris green in large quantities has been used in spraying the infected trees and grass. The work of extermination has been going on for the last five years, and until this year the results were far from encouraging. The pests had spread over 200 square miles in the northeastern part of the State, causing desolation equal to that by fire or flood, and \$275,000 had been appropriated by the State legislature for their destruction. The moths are said to have been introduced in this way: M. Trouvellot came to this country from France about twenty years ago, and, settling at Medford, studied the cultivation of the silkworm. One day he placed half a dozen eggs on the window ledge of his home. During a brief absence the eggs were blown off and scattered through the yard, so that their recovery was impossible. From these eggs were produced the army of moths that have done much to depopulate a large part of Massachusetts. Professor Lintner has suggested the discovery and introduction of a parasite that would feed upon and so destroy the moth.

A New Prepared Paper.

The *Droguisten Zeitung* is responsible for the statement that in Germany a patent has been refused, and the manufacture and sale have been prohibited, of a paper so prepared that any ink-writing upon its surface could be erased by the simple application of a moist sponge. The paper was made of the ordinary ingredients, with the addition of asbestos and parchment-glue. The paper pulp, after rolling, was immersed for a short time (from six to thirty-five seconds, according to the thickness of the paper to be prepared from it) in concentrated sulphuric acid at 20°, diluted with 10 to 15 per cent of water. It was then pressed between glass rollers, passed successively through water, ammonia solution, and a second time through felt rollers, and, finally, on polished and heated metal rollers. The finished article is said to be precisely like ordinary paper. Its sale has been prohibited on account of the misuse to which it can be put.

The History of Patents.

To the *Practical Engineer* (London) we are indebted for the following facts and anecdotes relative to early patents, the names of many discoverers, and the date of the inventions: While the lawyers and the treasury were wrangling over who could consume the greatest amount of seed corn wrung from inventors, about the year 1775 the treasury made one of its fiscal errors (so costly to the nation), which had an important bearing on patents of invention. Just as it shamefully overtaxes impoverished inventors now, without rhyme or reason, on a fiscal error which has lost it (or rather the public) £50,000,000 since 1852, so in the year 1775 it tried taxing the American colonies in the matter of tea entering Boston harbor. The colonies would not pay its exaction, and, fortunately, were far enough off to resist. A war followed, lasting many years, until on September 3, 1783, we had to acknowledge the independence of the colonies, and swallow the unpleasant fact that the fiscal error of the treasury had lost us America. One effect of this separation of the colonies was that all the old "£4 16s. 6d. extra fee" colonial patents running in America were, of course, canceled thereby. New patent laws were required in America in place of the old law, deceased, and the outcome was the creation, in 1790—1793, under George Washington, by Jefferson, of the best patent law that has ever existed—a law which has not only scattered untold benefits throughout America, but from which we in this country are also receiving reflected benefits. The fundamental principle of the American act is that "inventors and authors have equal and similar claims to the protection of the legislature"—in other words, that protection to inventors should be valid, and not a sham, and that lawyers and the treasury should not be allowed to plunder them. It is not difficult to realize why America took such care to cut absolutely clear from our chancery system. It would result from the fine object lesson chancery had previously given the world in their treatment of James Watt. If our patent system had been anything but a delusion and a snare, it would have protected an inventor such as James Watt, who gave the world the steam engine. It did nothing of the kind, but let him in for ruinous lawsuits, that ate up the whole of his profits for the natural term of his patent. What likelihood could there possibly be of protection for any humbler inventor, after such treatment of Watt? None whatever. The protection sold by the British Patent Office was evidently a farce, a very costly farce, too, at about £400 per patent for the United Kingdom. To such a miserable strait had the wrangling lawyers brought our patent laws at this period.

The establishment of the American patent system in 1790 was the protest of business men against the violation of all the true interests of invention by lawyers, who could not appreciate them. The movement was to invention what Luther's movement was to the abuses of the old Catholic Church: the spirit of invention was preserved, but the mummery was thrown aside. Inventors should remember that date—1790—as that when invention asserted its freedom. To avoid the old chancery trickery over worthless titles, leading to endless lawsuits, the American system introduced the preliminary examination system, and granted only patents which were as valid and safe from lawsuits as they could possibly be made. It gave these valid titles with business dispatch, instead of with endless legal delay, it printed its specifications in English, on paper, so that they could easily be consulted by inventors, instead of "engrossing them on skins, in black hand, in the Latin language," which was only fooling with invention. It gave 17 instead of 14 years for the duration of a patent, or 21 per cent more time. It charged only £7, instead of £400 for a United Kingdom patent, or only one fifty-seventh part of the lawyer's price. Here was abuse done away with at a stroke, but the effect on the fee hunters of chancery and the treasury would make them hate the American patent system as the Pope hated Luther. First, they would hate it because they would feel that for 167 years they had betrayed their trust, and been plundering instead of encouraging invention. Secondly, they would hate it because the business men at the head of the American Patent Office would be no party to the issue of worthless titles to patents out of which the lawyers could make "six or twelve fold law costs" in subsequent trials. Third, they would hate it because, if America issued patents at one fifty-seventh of their charges, it demonstrated beyond question that fifty-six parts out of the 57 charged had never been other than shameless extortion. Fourth, above all they would hate it from the fiscal error of the treasury having lost the American colonies, so that nothing coming from America could possibly have any merit in it whatever. The effect of this deep hatred of all things American 100 years ago has blinded us to the intrinsic merit of America's patent system, and withheld from the English people that which in their own interest they ought to have had from the very first.

The American patent system, working in the interest of the public, demonstrated to them its commercial value in the first few years. In 1791 Fitch, and

in 1793 Fulton, invented practical steamboats. In 1794 Whitney invented the cotton gin. Cotton planting at that time was languishing, and Whitney's invention made it exceedingly prosperous. Congress voted sums to assist invention, and at Washington a fine museum was erected, containing models and records of considerable public interest. When General Ross took Washington, in 1812, and burnt the Capitol, it was proposed to treat the Patent Museum after the same fashion. "A loaded cannon was trained upon it, when its director, Dr. Thornton, put himself before the gun, and in a frenzy of excitement exclaimed, 'Are you Englishmen, or only Goths and Vandals? This is the Patent Office, the depository of the ingenuity and inventiveness of the American nation, in which the whole world is interested. Would you destroy it? If so, fire away, and let the charge go through my body.' The effect is said to have been magical upon the soldiers, and to have saved the Patent Office from destruction." Our soldiers would report this incident when they returned home to England; news would be constantly reaching our persecuted inventors of the success of friends and relatives in America, under its patent system; many of our ablest inventors would leave this country for America in consequence, while a general feeling of unrest under our vicious, lawyer-ridden system would spread far and wide in this country. The knowledge among inventors that justice is granted them in America, and withheld them here, has led to the frequent forcing of the patent question on Parliament during the century. The 1790 prejudice against the American system has, however, always been sufficient to continue gross abuses in our patent system down to the present day. We have seen what came of a fiscal error of the treasury in 1775. Is it not about time it dropped the present one paralyzing invention?

During the 167 years from 1623 to 1790, the discouragement of the chancery system was such that only one useful invention appeared at an average of $3\frac{1}{4}$ years interval.

The best list of useful inventions that can be made out for this period only gives 14 of such for the first 100 years, and 37 for the remaining 67 years, up to 1790. Many of these inventions were not patented under chancery at all. They are as follows:

- 1623. Mannsell's glass patent.
- 1630. Ramsey's fire engine patent.
- 1643. Torricelli's barometre.
- 1649. Pascal's hydraulic press.
- 1650. Otto Guericke's air pump.
- 1657. Huygen's pendulum clock.
- 1664. Hill's breechloader.
- 1672. Wooden railroads.
- 1676. Barlow's repeaters.
- 1688. Papin's steam engine patent.
- 1698. Savary's steam engine patent.
- 1716. Floating docks.
- 1721. Halley's diving apparatus.
- 1723. Streets lighted with hydrogen gas.
- 1727. Leupold's high pressure engine.
- 1732. Ledemour's pump.
- 1736. Hull's steam tug.
- 1738. Iron rails nailed to wooden sleepers.
- 1739. Emerton's wood preserving patent.
- 1747. Watson's electric telegraph.
- 1748. Paul's carding patent.
- 1752. Franklin's lightning rod.
- 1756. Strutt's stocking frame.
- 1758. Dolland's achromatic telescope.
- 1762. Wedgewood ware patented.
- 1764. Blackley's tubular boilers.
- 1765. Spedding's gas light.
- 1767. Hargraves' spinning jenny.
- 1768. Lace machinery.
- 1769. Watt's steam engine patent.
- 1769. Arkwright's spinning frame patent.
- 1771. Crompton's mule patent.
- 1774. Lesargis telegraph.
- 1776. De Jouffroy's steamboat trial.
- 1777. Bushnell's torpedo.
- 1780. Pickard's crank patent.
- 1780. Leblanc's artificial soda.
- 1780. Burgard's argand burners.
- 1783-4. Cort's iron patents.
- 1784. Bramah's lock patent.
- 1784. Montgolfier's balloon.
- 1784. Watt's locomotive patent.
- 1785. Cartwright's locomotive patent.
- 1785. Arkwright's power loom patent.
- 1786. Lebon's gas light.
- 1787. Betancourt's electric telegraph.
- 1787. Hamer's wool shearing.
- 1787. Symington's steam engine patent.
- 1788. Miller's steamboat trial.
- 1789. Galvani's batteries, etc.
- 1789. Present rails and wheels invented.

THREE new torpedo boats have been ordered of Yarrow & Co. by the British naval authorities. They are to be 140 feet long by 14 feet 6 inches beam, and to have a guaranteed speed of 27 knots, which is equal to a little over 31 miles per hour.

Correspondence.**Scald the Scoundrels.**

To the Editor of the *Scientific American*:

I see in some of late newspapers that five masked men halted and boarded a locomotive of the California express, June 10, 1893, and forced the engineer to take a sledge, batter in the door of the express car, wounded the messenger, and robbed the express. Now, I am an old engineer—too old to do good service, nearly 73 years old—and it grieves my soul to read of an engineer being forced to compliance to such devils as those. I think every locomotive that travels on those long, lonesome roads should be furnished with a hot steam jet, one on the fireman's side and one on the engineer's side, with elastic pipes that they can point the jet in any direction and blow a masked man's eyes out with steam before he had time to use a revolver, or any other suspicious character that comes within 20 feet of the locomotive. Now, please make this idea known to the master mechanics or superintendents of locomotives everywhere, and I know they can furnish them and extend a steam jet into the express car, so that they can turn steam into the car and scald train robbers to death before they could get out of the car, and put a mark on them that they could be distinguished for a month after. I am too nervous to write much. Please scatter the idea as broad and as quick as you can, and oblige an old man that loves his fellow man that is honest and hates a dishonest person.

THOMAS R. ALLEN.

Lucas, Lucas County, Iowa, June 17, 1893.

Shapes of Eggs.

Various attempts have been made to account for the diversity in shape seen in eggs. A recent study convinces Dr. Nicolsky that the differences may be all traced to gravity, and he finds his idea confirmed by all the eggs in the zoological collection of the St. Petersburg University. He supposes that pressure by the sides of the ovary tends to elongate the egg before the shell has hardened. In birds which keep a vertical position while at rest, as do the falcon and the owl, the soft egg is made short by the action of the weight of the body against the ovarian pressure; while in birds that, like the grebe, are nearly always swimming, the egg is lengthened because the bird's weight acts with the compression by the ovary. The egg is made more pointed at one end than at the other in birds that, like the guillemot, are frequently changing their position—sometimes swimming and diving, sometimes perching on the rocks, etc.

Soapsuds as a Lubricator.

I had a curious lubricating experience a few years ago that I would like to put on record, observes Gulf in *Railway Appliances*. The machine that gave me the trouble was for experimental purposes, for what purpose it matters not. The trouble lay in the lubrication of a shaft that had to make 4,000 revolutions per minute. It was about four and a quarter inches in diameter, with journals from eight to nine inches long, and carried a weight of 1,800 pounds. The thing simply wouldn't run cool. We cut oil grooves in the boxes; we scraped them; we used every kind of metal that we could think of; we hitched on a pump and pumped gallons of oil through those bearings; and yet, in from five to ten minutes, they would commence to heat, and nothing seemed to be able to stop it but the stoppage of the machine.

One day, in a fit of despair, we put soapsuds in the tank instead of oil and started to pump that in. Presto! The bearing had found the food for which it was craving, and proceeded to do its work with the cheerfulness of an old campaigner. It seemed that it was not so much the quantity of lubricant that was needed as a regular and continuous supply. The oils that we were able to use had a consistency that unfitted them for reaching the remote points under the rapidly revolving bearings, so it heated, while the soapy water was thin enough to be forced over the entire surface and keep everything all right. I presume that there are oils that would have done the same thing, only we did not happen to get hold of them. But if you ever attempt to use water, remember that you will need it all the time and in large quantities.—*Railway Review*.

Use of Compressed Air to Cool Journal Bearings.

In any place where air compressors are used steadily, or where an air supply is convenient, it is quite convenient to conduct a pipe so as to blow air upon the heated bearings, and thus cool their heated brows, as the air will conduct heat away nearly as well as water. Air has an additional advantage in the fact that it cools in expanding so as to still further aid in the cooling of boxes where this scheme is applied. We are inclined to agree with an exchange that it may seem visionary, but if you have a good chance try it, and see if it don't help keep them cool, the help depending upon the flow of air and the pressure from which it expands, as expanding air cools very rapidly.—*Railway Review*.

THE KRUPP EXHIBIT AT THE GREAT FAIR.

(Continued from first page.)

about 80 tons, and the total load on the rails was, therefore, nearly 230 tons. It was illustrated and described in the SCIENTIFIC AMERICAN of April 22, 1893.

The next gun that attracts attention is of smaller caliber, and though less monumental, is a far more serious weapon than the 122 ton gun. This is the 12.01 in. caliber; it is not a new gun, but is far more interesting on that account, for it has already withstood the severe test of 98 rounds, and is still in service as a naval gun. This is a specially interesting exhibit, because it is mounted complete on its turret carriage, and the hydraulic arrangements for working and loading are very well illustrated.

The 28 cent. (11.02 in.) gun is the next that attracts attention; this, as exhibited, is mounted on a coast defense hydraulic carriage, but the same type is also used for naval purposes. The length of bore is 40 calibers, or 36 ft. 6 in., and the total weight is 43 tons. This gun is mounted on a carriage which permits it to have a maximum elevation of 45 deg., at which angle the range is 20 kilometers (12½ miles); the weight of projectile fired is 759 lb., and the charge is 352 lb. of brown prismatic powder. With this charge an initial velocity of 2,066 ft. has been obtained. This gives a striking energy at the muzzle of 6,979 metric tons, reduced at a distance of 2 kilometers to 5,300

metric tons. This exhibit is made all the more attractive because it is inclosed within a shell-proof case-mate, and it may be mentioned that as the gun was constructed last year, it may be considered to represent the latest Krupp type of heavy artillery.

A similar range of 12½ miles is that assigned to the next gun of the series shown in the Krupp pavilion; this is the 24 cent. (9.45 in.), intended for coast defense, and mounted on a coast defense carriage; the bore is 40 calibers in length, and the total weight of the gun is 31 tons; the maximum elevation that can be given is 44½ deg. A special interest attaches itself to this particular gun, because it was tested in the presence of the German Emperor at Meppen on April 28, 1892. On this occasion a range of 20,226 meters, or nearly 13 miles, was attained.

Various other guns and their mountings are shown. The second part of the exhibit consists of armor plates manufactured at the Krupp works. Of these, perhaps, the most interesting are some compound and nickel steel plates. There is a compound plate, 15.75 in. thick, a nickel steel plate, 11.8 in., and a third of the same character, but of different quality, 10.23 in. thick.

Passing from the exhibits coming from the armor

axes. This part of the exhibit at least is of particular commercial value, because the Essen works have a large trade with America in this branch of their industry.

Of cast steel there are some notable examples. The largest is the bow frame for a new German ironclad; the part shown weighs 24 tons, and is 42 ft. high; this is made in three parts. There is also a portion of a stern frame for the same ship, in two pieces, weighing respectively 12.8 and 11.3 tons. It may be mentioned with regard to these castings that they could not be conveniently transported by rail, and were brought all the way from Essen to Chicago by water. There is also an engine bedplate of 6.3 tons; there are some examples of steel locomotive side frames, and a number of other objects, the most important of which is a reproduction of the screw of the German Lloyd steamers Spree and Revel.

There is also quite a collection of mining machinery, which has always been a specialty of Essen. The walls of the pavilion are hung with a number of views illustrating the Krupp works. At the end of the main hall are seven large drawings, three of them—the largest—being of the works, and the others plans of the Meppen testing grounds and diagrams of the progress and development of the Krupp industry. Beneath are two very interesting memorials, the first contributed by the workmen and employees in honor of the

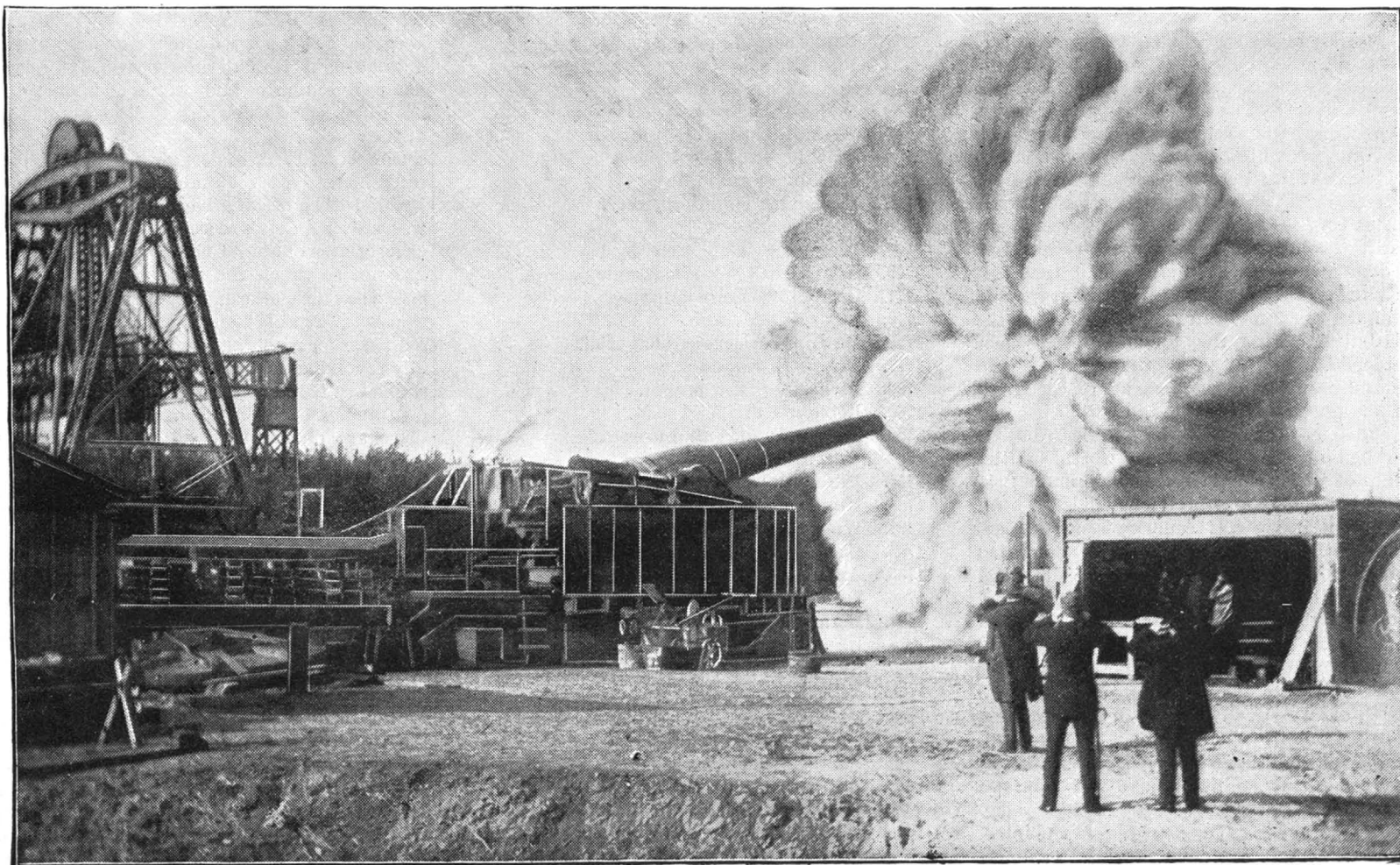
founder, the late Alfred Krupp, and the other a representation of the old dwelling place of the founder, a modest house that speaks eloquently of the developed fortunes of the family, thanks to the energy, talent, and opportunities of the founder. This house has been preserved intact as a memento, and is highly prized by all those associated with the works. A number of portraits of the more prominent directors and photographs of the more famous guns built at Essen complete this very remarkable exhibit. We have said enough, says *Engineering*, to show that not only has Mr. Krupp fully maintained the reputation of his firm by this remarkable exhibit, but he has added additional glory to the German section, and has contributed more than any other single exhibitor to the success of the World's Fair.



THE KRUPP BUILDING AT THE WORLD'S FAIR.

plate section of the Krupp works, we come to those sent out of the plate mills of a lighter type. Probably this part of the exhibit will illustrate more clearly to a greater number of visitors the magnitude and resources of Essen. First comes a section of a boiler, weighing nearly 3½ tons; it is 12 ft. 10 in. in diameter, and the thickness of the plate is 1.5 in. The next heaviest plate weighs 16 tons; it is made of Siemens-Martin steel, and is 65 ft. 9 in. long and 1.26 in. thick. There are also some fine specimens of stamped and flanged steel plates for boiler work. The largest casting shown is to form part of a 5,000 ton stamping press; it weighs 62.4 tons, and is 12.2 in. thick; the length is 27 ft., and the diameter 44 in.

In railway material there is shown a group of 54 steel tires, a number of complete wheels, and a collection of



FIRING THE GREAT KRUPP GUN.

THE KANSAS EXHIBIT OF MOUNTED SPECIMENS OF THE ANIMALS OF THE STATE.

The exhibit of the State of Kansas at the World's Fair presents no more interesting feature than that of the superb group of specimens of its fauna, mounted in the highest type of taxidermy. In the cuts we illustrate some of the more striking features of this incomparable exhibit, whose size renders the reproduction of the whole within the limits of our columns quite impossible. The first group contains a number of the Rocky Mountain goats; one of the most difficultly procured specimens of this country. Mounted on the crags, this rock antelope—for it has now been relegated to the class of true antelopes—is seen at different stages of its growth expressing in its characteristic attitude and in the background on which it is mounted the life habits of the animal. Toward the foreground a beautiful group of deer present an object more familiar to the sportsman and naturalist. The great rarity of this antelope and the difficulty of reaching it in its almost inaccessible home makes the group one of the very highest value.

Next comes a specimen of the American elk or wapiti, one of the noblest specimens of the deer tribe that has ever existed, and surpassed in size by very few members of the deer family. Toward the background of this cut may be seen a bear looking forward toward the spectator.

But a few years ago the plains of

and mounted family of buffalo. Upon the plains which they inhabit vast numbers of antelope—the pronghorn—lived, and back of the buffalo a group of these animals is appropriately placed. The pronghorn is interesting as being one of the two representatives of the antelope tribe found in America, the Rocky Mountain goat being the other. The pronghorn is

lip, and great flat antlers, it forms a most striking object. The Kansas exhibit is rich in mounted specimens of this animal. In one group an animated reproduction of a battle between two of the bulls is shown, destined, it may be imagined, to end in an interlocking of the antlers, with death of both combatants. As if with some such expectation as this, a party of wolves are awaiting the issue of the combat.

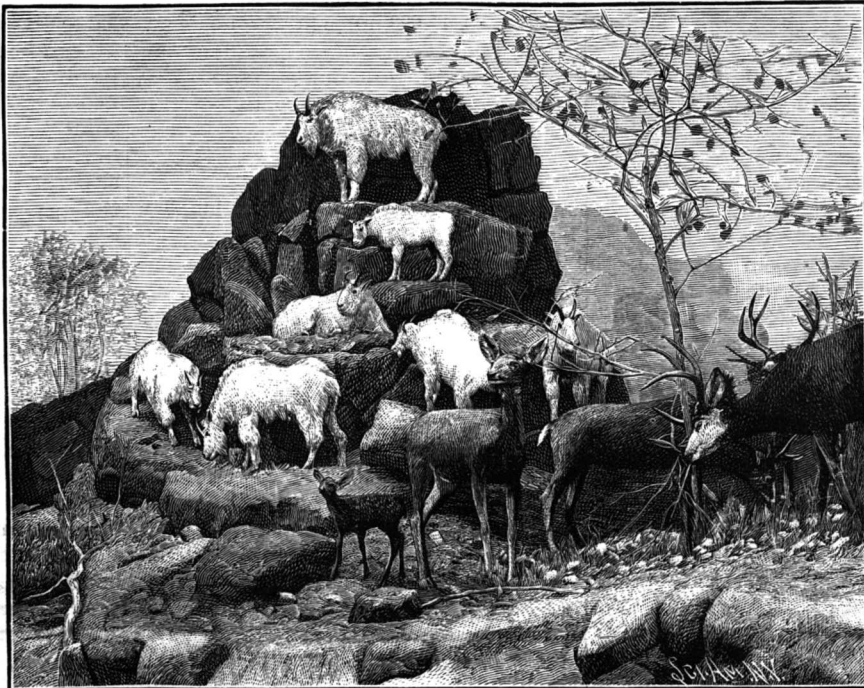
The more peaceful aspect of the moose's life is shown in the next group, where the family—father, mother, and fawns—are shown peacefully assembled. When it is noted that this animal may stand seventeen hands high, or as high as a very large horse, the impressive aspect of these groups may be imagined.

The illustrations will give the reader some idea of these triumphs of the taxidermist's art. In other parts of the exhibit the very rare moufflon, or mountain sheep, the bighorn of the trappers, is shown in great abundance and in many lifelike attitudes, as it stands upon the craggy eminence provided for it. Bears, wolves, and other characteristic specimens of the fauna of Kansas are also shown. The entire group from the point of view of the naturalist is of the highest value.

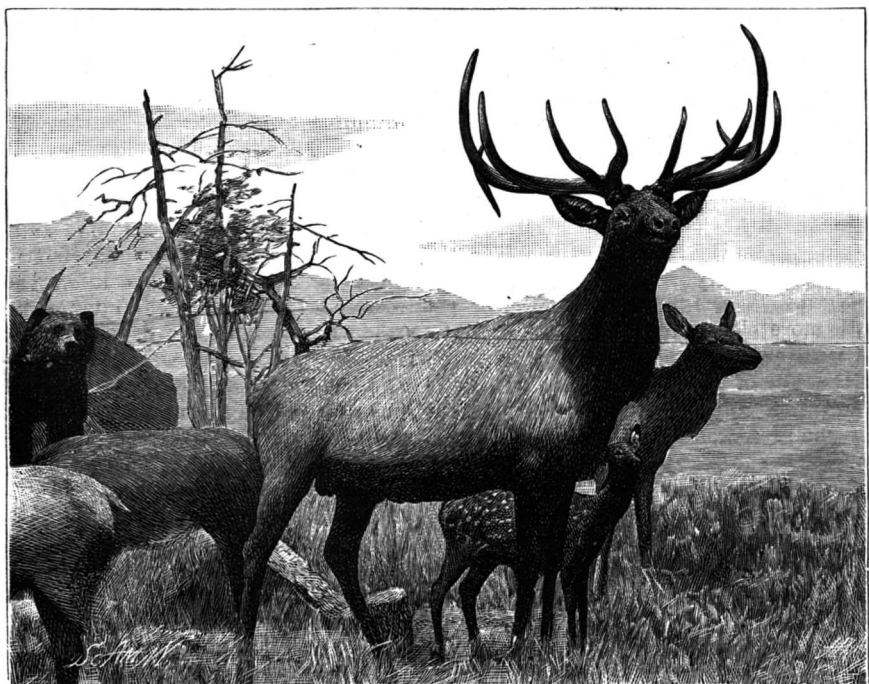
A correspondent sends us the following:

KANSAS STATE EXHIBIT OF MOUNTED ANIMALS.

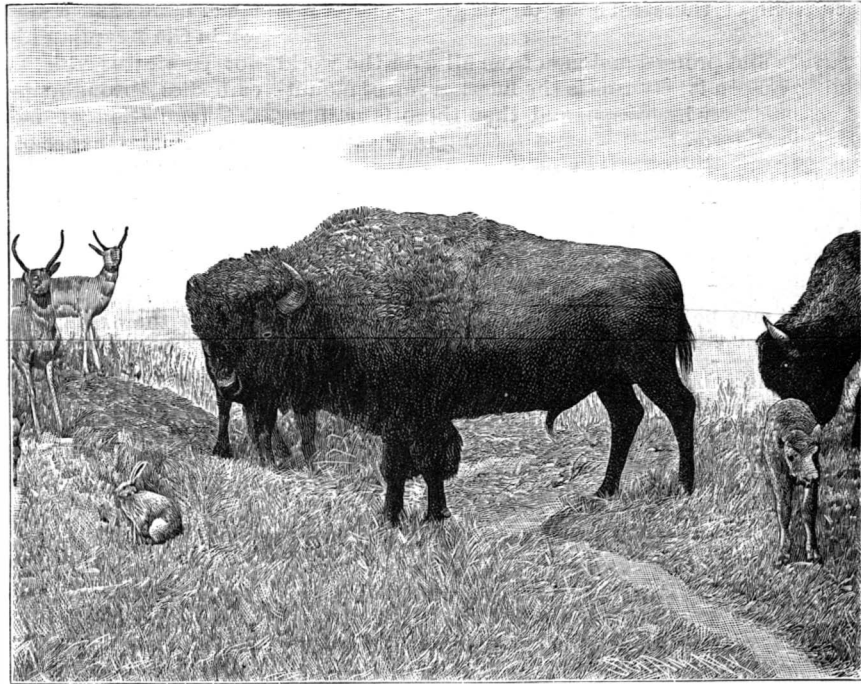
In the north wing of the Kansas building is one of the most remarkable exhibits to be seen at the great Fair.



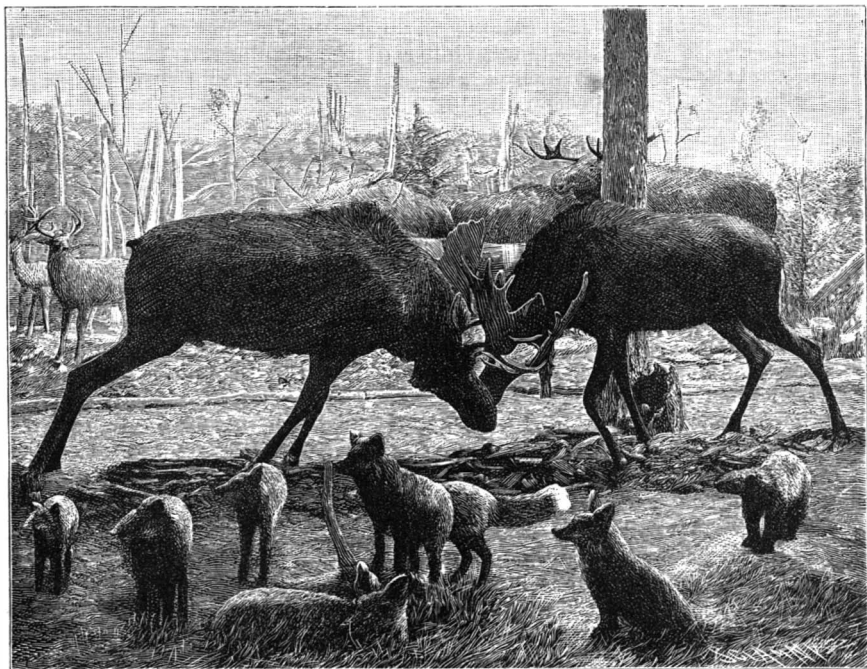
GROUP OF ROCKY MOUNTAIN GOATS.



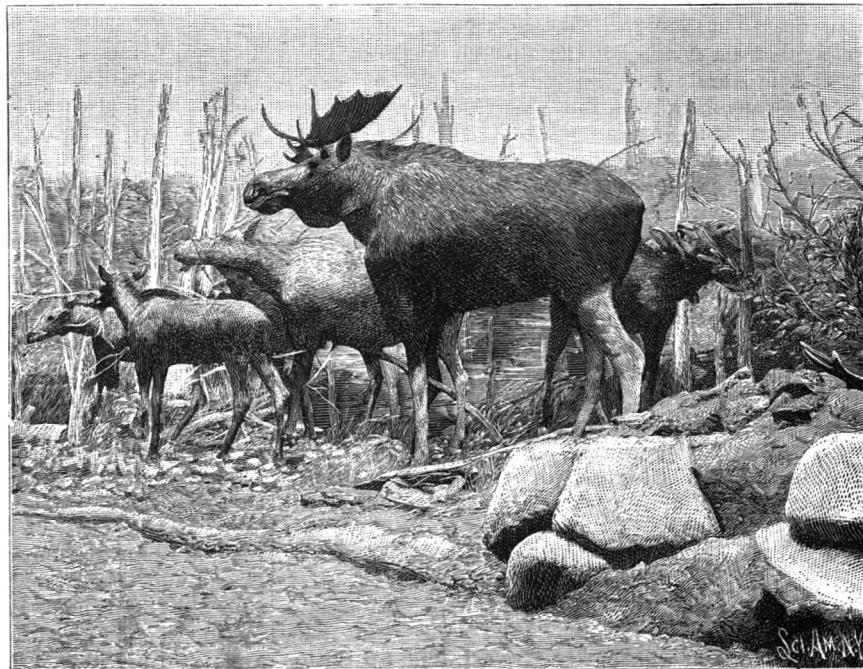
FAMILY OF ELK.



BUFFALO AND PRONGHORN ANTELOPES.



COMBAT OF MOOSE BULLS.



FAMILY OF MOOSE.

THE WORLD'S COLUMBIAN EXPOSITION—THE NATURAL HISTORY EXHIBIT FROM KANSAS.

Kansas swarmed with countless herds of buffalo; so plentiful were these that passengers on a railroad car used to indulge in the brutal amusement of firing at them as the train passed by the herds; now the animal is well nigh extinct, but a few hundred being left in the entire area of North America. Kansas accordingly presents among her other specimens a finely stuffed

an exception to the antelope tribe in the fact that it sheds annually the sheaths of its horns, in a measure similar to the deer family.

The greatest member of the deer family, the shooting of a specimen of which is one of the greatest glories of the American hunter, is the great moose. With its high withers, short neck, prehensile upper

I refer to the natural history display made by the Kansas University.

This exhibit is the work of a man who is recognized by naturalists as the best taxidermist in this country, if not in the world, and a specialty of his is the larger mammals of North America. To this branch of the study of animal nature Professor Lewis Lindsey Dyche

has given many years of his life. The exhibit which he has brought to the World's Fair is the result of ten years' work in the field collecting and fourteen months' work in the taxidermic shop, with five assistants.

In this collection there are 105 mounted animals and 20 heads.

In the southwest corner of the wing will be found one of the grandest groups in the whole collection. This is a group of seven moose, shown in photographs sent. The herd is headed by an enormous bull, that stands 9 feet 2 inches from the ground to tip of his antlers. Near the bull is an old cow with twin calves. The cow is riding down a tree in order to give her calves a chance to browse the leaves.

On a little rise of ground, off from the moose, stands a herd of nine mule deer of the Rockies. On a promontory of rock above the mule deer is a group of the most remarkable animals—the Rocky Mountain goat, seen here as in his home. Under the ledge of rocks at the bottom of the craggy mountain on which are the goats is a mountain lioness and her two cubs.

On the eastern end of the wing stands another fine collection of animals, very artistic in arrangement. This is a group of six elks. The group is headed by a bull, said to be the finest ever taken from the mountains. He stands 10 feet and 9 inches from the point of his toe to the tip of his antlers.

The last group along the wall is on the extreme southeast, and is one that never fails to attract attention. It is a group of buffalo, or the American bison. An immense bull, the largest ever mounted, not excepting the famous bull in the American Museum, is the leader of this herd of five. The group is one of the most natural of the entire exhibit.

There is a group in the left center that cannot be spoken of too highly. The action is perfect, as can be seen by our cut. It is a pair of fighting bull moose. These animals are struggling hard for supremacy, and the details of the work done on the group makes it a masterpiece.

Artists and professional men from all over the world who have seen it say this is the finest group of mounted animals they have seen, and that there is nothing like it in the world. F. D. PALMER.

A Lightning Calculator.

There has arrived in London from Paris, M. Jacques Inaudi, a gentleman to whom Babbage's calculating machine would be a poor second. He gave an exhibition of his abilities recently to a small party at the Hotel Victoria, and did some vigorous ready reckoning. M. Inaudi is a little man with a pleasant face crowned by a large square forehead and ornamented with a heavy crop of upright hair and a small mustache. He has other subjects of conversation than decimal fractions and the extraction of cube roots, and does not mind in the least talking about the weather or the Panama Canal while doing complex sums. The banqueting room of the Hotel Victoria, where the *seance* was held, was reminiscent of the class room, as it contained a row of blackboards with attendant chalks. Everybody wanted to pose M. Inaudi with racking sums in all the varieties of arithmetic, but he was equal to the occasion—to half a dozen occasions, in fact—for at one time he played dominoes, found the square of a number which ran into billions, carried on a conversation in French, and announced his results in English. The names of the numerals form nearly all the English he knows. In four minutes and twenty seconds he worked out—carrying on a conversation at the same time—a sum in addition with six figures in each of six lines, a sum in subtraction running into millions, divided six millions odd by eighteen thousand odd, found the square of an eight-figure number, the cube root of one sum and the square root of another. This all was done without a figure in sight or any aid to calculation further than that afforded by occasionally resting his finger tip on the tip of his nose. What was more, he proved that the gentleman who was checking his results on the blackboard was wrong in one instance. Then, in an airy way, he recited, still without having seen a figure, every number on the blackboards behind. Here is a little sum in subtraction, which M. Inaudi worked out in less than a minute, the component numbers being dictated to him by various of the gentlemen in the room:

974,325,436,501,212,741,682,412
489,425,179,111,237,103,426,014

Result—484,900,257,389,975,638,256,398

M. Inaudi, who will shortly give a public exhibition of his powers, is a self-trained calculator, starting life when eight years old as a shepherd.—*Daily Graphic*.

Completion of the Great Dam Across the Colorado River.

A press dispatch from Austin, Texas, dated June 7, says: The regatta which began here to-day has brought together the world's greatest oarsmen and the prospects are good for fine racing during the four days it lasts. The regatta is in the nature of a celebration in honor of the completion of the great dam across the

Colorado River, which is a remarkable piece of solid masonry. The length of the dam is 1,150 feet, it is 66 feet high, 60 feet broad at the base and 16 feet at the crest. It has formed a lake 22 miles long with an average width of 1,200 feet, containing 21,000,000,000 gallons of water, or enough to supply the city of Austin twenty years without being replenished. The purpose of the dam is to furnish a water supply and power for the electric light system of the city. Besides accomplishing these purposes, 14,000 horse power has been developed, which will be disposed of to manufacturers at nominal cost. The cost of the dam was over \$600,000. This great work was illustrated in the SCIENTIFIC AMERICAN of September 24, 1892.

The Oldest Book in the World.

The only complete work that, without question, can lay claim to being the oldest book in the world is known as the "Papyrus Prisse," and now forms one of the treasures of the Bibliotheque Nationale. It was presented to the great library of Paris by a Frenchman of the name of Prisse, who discovered the papyrus at Thebes. The tomb in which it was found contained the mummy of one of the Entews of the eleventh, or first Theban, dynasty. The date when the manuscript was written cannot, therefore, have been later than 2500 B. C. But if the exact age of this identical copy should be doubtful, we know precisely, from the text itself, the date of its composition, as it states it was compiled by one Ptah-hotep, who lived in the reign of King Assa. The full title runs: "Precepts of the Prefect Ptah-hotep, under the King of the South and North, Assa." As this king was the last but one of the fifth dynasty, Ptah-hotep, who flourished in the reign of this Pharaoh, and held the distinguished office of "prefect," must have compiled his work about 3350 B. C. Divided into forty-four paragraphs or chapters, the work is something very much more than a mere literary curiosity. It is written in the Egyptian hieratic character; is rhythmic, if not poetic; is addressed to the educated classes and embodies throughout high and noble principles for the regulation of individual life and conduct and for the maintenance of good government. The man in authority is enjoined by this very ancient writer to labor at all times to be a true gentleman, lest from his own defects of character he suffer the authority given him by favor of the Supreme Being to be weakened. An Egyptian prefect was the highest dignitary in the land, second only in authority to Pharaoh himself. It was the office held by Joseph in the Biblical story: "Only in the throne will I be greater than thou." The prefect had the custody of the key of the Larit, or royal granaries, to which no entrance could be obtained without the production of the prefectorial seal. The holder of the office was at once the Egyptian First Lord of the Treasury, Chancellor of the Exchequer, and, in his judicial capacity, Lord Chief Justice of Egypt.

All our greatest Egyptologists bear testimony to the extraordinary civilization of ancient Egypt. The work of Ptah-hotep fully confirms this position. It testifies to a height of culture and refinement obtaining in Egyptian society 5,240 years ago that to our Western circumscribed notions of modern superiority are simply inconceivable. The teachings of the "Precepts" more than justify all that has been said by Egyptologists. "It is certain," says Professor Renouf, "that at least 3,000 years before Christ there was in Egypt a powerful and elaborately organized monarchy, enjoying a material civilization in many respects not inferior to that of Europe in the last century." Leptius writes: "The fourth dynasty ascended the throne about 3124 B. C., and at that time, long before our usual ideas of the development of nations, there is found a people highly instructed in all the arts of peace; a state carefully organized; a hierarchy firmly founded, minutely divided and organized to the smallest external matters; a universally diffused system of writing and the common use of papyrus: in short, a civilization which in all essential points has already attained its full maturity, and only by close investigation is further development in some directions discovered." So also Professor Maspero: "In one of the tombs of Gizeh, a high officer of the first period of the sixth dynasty (B. C. 3703) takes the title of 'Governor of the House of Books.' Not only was there already a literature, but this literature was sufficiently large to fill libraries, and its importance was so great that one of the court officers was specially designated for the keeping of the royal library." The wisdom and high moral teaching embodied in the precepts of Ptah-hotep abundantly confirm this testimony. This old writer urgently enforces on rulers the cultivation of the doctrine of "Ma," an Egyptian dogma, comprehending "the true, the beautiful, the good." "Ma" is the principle of order and harmony in everything; it is the steadfast pursuit of wisdom, knowledge and obedience—obedience as the best of all. Although, as in modern expression, we should say "extremely liberal" on many subjects, politically, Ptah-hotep displays an oriental horror of innovators and innovations. Ideas that may be new to the generation are

not necessarily new to the world, and changes do not always imply progress.

According to Ptah-hotep, contemporary estimates of human actions are not always the most reliable or the most enduring. "Not of the counsel of the flatterers of to-day is it needful to take heed; it is of the judgment of posterity rather which renders justice to righteous actions."

"Only by a consistent life of reverence for knowledge and wisdom; by observing a just moderation in everything; not abusing authority, but by seeking to inspire love rather than fear, can we hope to appear before posterity with honor." In sixteen different instances in which Ptah-hotep speaks of God he does so in the singular number—an argument happily no longer needed to establish the monotheistic character of the Egyptian religion. He ends by saying: "I have reached one hundred and ten years of life, blessed by the favor of the king, among the first of those who have exalted themselves by their works, doing the pleasure of the king in an honored position." "The Precepts of Ptah-hotep" have been translated from the hieratic into French by M. Virey, and retranslated into English by Professor Osgood. They reveal throughout the mind of one who all his life has been accustomed to the higher walks of society in a well-ordered state. The sixteen pages of the "Precepts" are in the manuscript preceded by a few leaves of a still earlier work, written by one Kakimna, Prefect to King Seneferu, of the third dynasty. Had this work been complete, we should have been able to boast of a book older than the Pyramids and dating from 3,760 years before Christ—a book 5,650 years old!—J. H. Mitchiner, in *Knowledge for June*.

The Discovery of Lithography.

One of the greatest discoveries ever made was the result of the purest accident. It was in the year 1796. The citizens of Munich had just witnessed the first triumphant performance of Mozart's opera "Don Juan," and the theater was deserted by all save one man, Alois Senefelder, who, after making a round of inspection in the building to see that no sparks had ignited anything combustible, retired to his room to stamp the tickets of admission for the day following. When he entered his apartments he had three things in his hand—a polished whetstone which he had purchased for sharpening razors, a ticket stamp still moistened with printing ink, and a check on the treasurer of the theater for his weekly salary. As he placed the latter upon the table a gust of wind swept it high up in his room for a moment and then deposited it in a basin filled with water. Senefelder dried the wet paper as well as he could and then weighed it down with the whetstone, upon which he had before carelessly placed the printing stamp. When he returned to his room the following morning he was astonished at seeing the letters of the stamp printed with remarkable accuracy upon the dampened paper. A thought came to him. He wondered whether by some such means he could not simplify his work of continually copying the songs of the chorus. He went out and purchased a large stone, commenced making experiments, and, as we all know, finally discovered the art of printing from stone—lithography.—*Stone*.

Novel Foundation Laying.

Several novel features of construction will appear in the new building of the Manhattan Life Insurance Company, in course of erection in lower Broadway, New York. The great structure will have a steel skeleton frame, and will tower aloft to an elevation of 300 feet above the curb line. The supporting piers of the building are to be sunk to bedrock by what is known as the pneumatic process. The reason for the employment of this plan is that the soil is a fine sand for a depth of about fifty feet overlying the rock. It would be a great risk to build so heavy a structure on the sand, and to excavate to such a depth would very likely result in undermining neighboring buildings, especially as the soil is very wet. The difficulty is to be overcome by sinking pneumatic steel caissons, fifteen in number, by the same means that are often employed in laying the foundation for bridges, and which was used in connection with both towers of the Brooklyn bridge. When the caissons reach bedrock, the workmen inside level the rock, so as to give a firm bearing, and then fill in with concrete, so that the space from the top to the bottom of the caissons is solidly filled, and upon these piers in turn will be placed huge cantilevers, from which will be built up the skeleton steel structure of the building.

Bottles in China.

It is stated that the Chinese much appreciate European bottles. They have a great liking for them, and will resort to subterfuge, if necessary, to get hold of them. The common people worry the medical missionaries considerably upon this point, shamming sick in order to be supplied with a bottle of medicine. The authority for this report does not furnish any information as to what our celestial friends do with the bottles.

Chinese Cheap Labor.

American medical missionaries are now very popular in China. They are everywhere welcomed, more especially because they offer both medical advice and medicine gratis, prefaced with religious exercises. The Chinese appear to appreciate this kind of practical religion. In a recent letter to the *Missionary Herald*, Dr. Chapin tells of his missionary successes in the vicinity of Pang Chuang, and says:

"On this trip I learned for the first time that there are in this part of China a number of 'counterfeit' foreigners. I was myself taken to be one of that class, because of an ability to make myself understood in Chinese. It seems that one or more enterprising Celestials have gone into the work of dispensing medicines after the manner of the American physician. Usually two or three men go together. One of these dresses in foreign costume and talks a gibberish which is not understood by the natives, and so passes for a foreign language. In imitation of American physicians, all medicine is given away, but, unlike that fraternity, the bogus representative of America is quite willing to receive contributions of grain to feed the animal which helps convey him from village to village. In consequence grain pours in upon him by the quantity. This is disposed of by a confederate at the nearest fair, and then Ah Sin departs for 'fresh fields and pastures new.'"

The High Atmosphere.

Beyond 29,000 feet above sea level, the height reached by Glaisher, in 1862, man has never been able to navigate the air. Various problems concerning the region farther away—such as the temperature, the pressure, the quantity of moisture, the composition of the air, etc.—have attracted the attention of physicists, and have at last led to the experiments of M. Hermite, who, during the last few months, has been sending up pilot balloons, carrying registering apparatus. These balloons are very light, with a capacity of about 100 to 200 cubic feet. Falling at distances from Paris ranging up to 200 miles, the balloons have nearly all been returned by their finders, as requested on a card attached to each, and one has brought down records from a height of 30,000 feet. The instruments used are very light and simple. With larger balloons and systematic exploration, it is hoped that the secrets of the air up to at least 40,000 feet may be made as familiar to us as those of the deepest and darkest depths of the sea are gradually becoming.

THE FIN CUTTER LENI LENEPE.

The changes and improvements which the ingenuity of modern man is constantly producing are well illustrated in the new type of sailing boats which are now rapidly coming into use. We here give a photographic portrait of the *Leni Lenepe*, a fin cutter, built by Clay & Torbensen, of Gloucester City, N. J., who rank among our most progressive and scientific architects, not only in the line of sailing yachts, but steam and sail craft of every description. Compared with the clumsy, round-bottomed boats of our forefathers, the new style of sailing craft here shown presents an odd and strange appearance.

The *Leni Lenepe*, probably, in point of construction, is the lightest fin keel cutter ever built in this country and is also one of the fastest of her class. Dimensions are 29 feet on deck and 16 feet 10 inches on L. W. L., extreme beam 6 feet 4 inches. The boat is a marvel of lightness and strength; planking is of $\frac{5}{8}$ inch white cedar, ribs of white oak, straight grained and steam bent, $1\frac{1}{4}$ inch by $1\frac{1}{2}$ inch, spaced 10 inches on centers; floor timbers are of iron, keel and deadwoods of white oak. Fin keel weighs 2,000 pounds and is bolted through keel with composition bolts. All rivets and fastenings are of brass and copper, and the method of planking is such that no calking is required; no seams are visible. The hull is finished as smooth as glass. Hull, spars and rigging weigh only 1,750 pounds. We are informed this yacht has out-sailed and outpointed all boats of her class with which she has competed.

Foreign Honors to an American Architect.

Architect Richard M. Hunt, of this city, has just received at the Royal Institute of British Architects, the Queen's gold medal. Mr. Hunt is the first American on whom this honor has been bestowed. It is understood that Mr. Hunt received the medal on account of his excellent work at the Chicago Fair. Mr. Hunt has spent considerable time abroad, and much of the refined taste exhibited in his various works can be attributed to his cosmopolitan experiences.

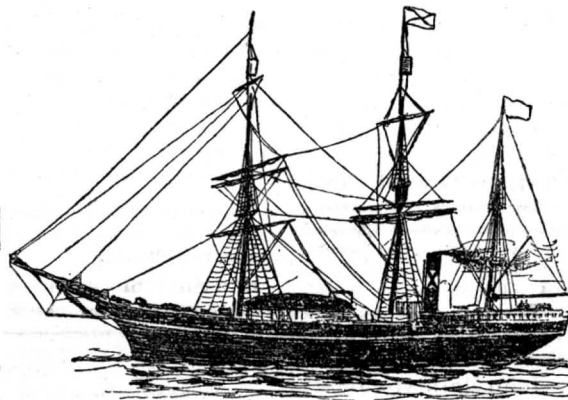
THE PEARY ARCTIC EXPEDITION.

The first chapter in the history of Lieut. Peary's new Arctic expedition was opened on the 2d of July, when the ship that is to bear him and his party to the polar regions took her departure from New York. The vessel, known as the *Falcon*, is a strongly built sealing steamer, belonging to St. Johns, N. F., and has been specially chartered for this service.

We give a small portrait of the ship.

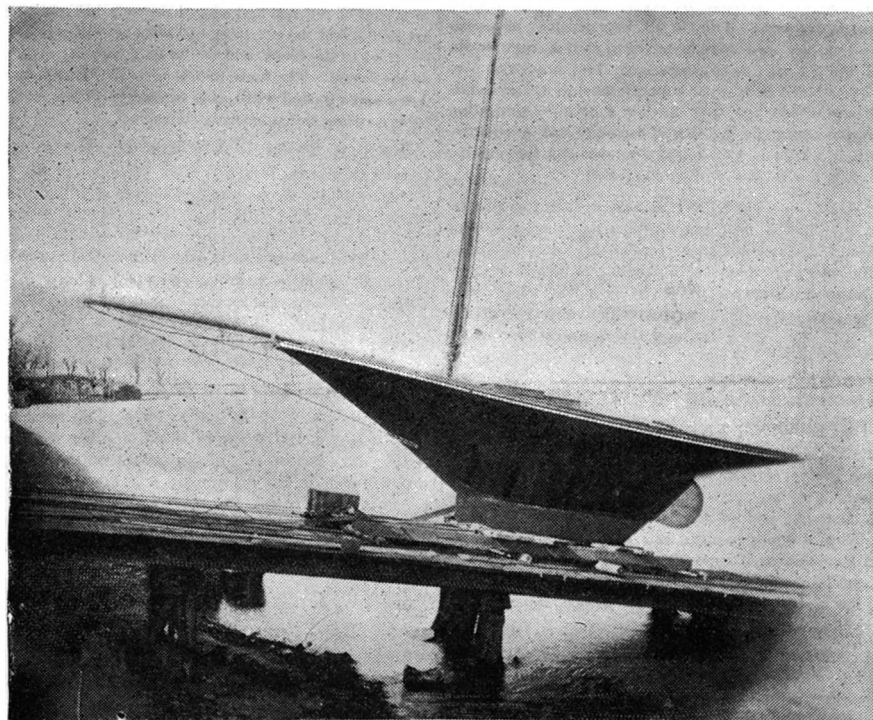
The *Falcon* will touch at Boston, Portland—which is Lieut. Peary's old home—and at St. Johns, Newfoundland, where the crew of the vessel belongs. From St. Johns the vessel will sail direct to the Arctic seas, making the first landing at Inglefield Gulf, where Lieut. Peary will establish his station.

The *Falcon* is bark rigged, 162 feet long, 26 feet beam, draws 17 feet, is 311 tons burden, and has twin screws. She is strong and capable of ramming the ice. On deck she carries a steam launch and whale boats.



PEARY'S SHIP, THE FALCON.

Besides Esquimaux dogs, eight Rocky Mountain burros are carried. Lieut. Peary will teach the burros to walk on snow shoes, and they will be taken on the inland trip to carry the provisions; when their load is used up, they will be killed for food for the dogs. A cote of carrier pigeons is also taken along. Among the curiosities we saw in the cabin was Lieut. Peary's sleeping bag, which is made of the winter coat of the reindeer. The weight is $10\frac{1}{4}$ pounds, hair side inward. Lieut. Peary says he has slept in these bags in perfect comfort when the thermometer registered the very low temperature of 45° below zero F. Packed away in the hold along with the three years' provisions is the house which will be erected in Greenland and which will shelter the party for two winters. The following particulars in regard to the house were furnished the *SCIENTIFIC AMERICAN* by Lieut. Peary. The house will be 33×14 feet on the ground plan, and $7\frac{1}{2}$ feet high, and will be divided into compartments. The walls of the house are divided as follows: First, an in-



THE FIN CUTTER LENI LENEPE.

ner lining of red felt, then an air space of one inch; a sheathing of matched boards comes next, then an air space of one foot, then a layer of tarred paper; another sheathing of matched boards is followed by a layer of tarred paper; a four foot corridor comes next, and the boxes of supplies form the outer wall. The house will be heated by steam and lighted by electricity. The launch engine and boiler will be taken out of the boat when navigation closes, and will furnish steam for heating and for running the dynamo. Coal oil will be burned. Lieut. Peary's house certainly has all the modern improvements.

The *Falcon* will be sent back after landing the cargo and is under contract to return in the summer of 1895.

The expedition will now consist of fourteen members. The list is: Lieut. and Mrs. Peary, Mrs. Cross, of Brooklyn (Mrs. Peary's maid); S. G. Entrikin, West Chester, Penn.; James W. Davidson, Austin, Minn.; E. R. Baldwin, Oswego, Kan., meteorologist; Dr. E. Vincent, F. W. Stokes, Philadelphia, artist; W. J. Swain, Indianapolis, stenographer; Hugh Lee, Meriden, Conn.; G. H. Carr, Chicago; Evraud Astrup, the Norwegian geologist; George Clarke, Brookline, Mass.; and Matthew Hanson, a colored valet.

On the east side of Inglefield Gulf, Greenland, in about latitude $78^{\circ} 45'$ north, 35 miles somewhat north of east of Redcliffe, Lieut. Peary has selected the site of what may be termed the headquarters of his Arctic expedition. It is 400 miles north of the most northern station now occupied in Greenland. There will be reconstructed the winter house above described, and thence Lieut. Peary will make exploring advances, and perhaps approach the north pole.

Ivorytypes.

BY GEO. G. ROCKWOOD.

Recently, in overhauling my establishment, I unearthed some ivorytypes which were made fully twenty or twenty-five years ago. They were in such a fine state of preservation, and make such beautiful and permanent pictures, I am about to revive them.

As many of the fraternity don't know how to make these pictures, I send you a description of the methods used. I think they will be a good thing to reintroduce. Many fine styles of pictures have had their "day," and have been dropped for some novelty—often, I think, unwisely. The ivorytype is one of the illustrations of this tendency. It is no step backward to make them.

Process.—First.—Make a print on plain paper, strong and brilliant; now edge a common clean glass to the width of a quarter of an inch with glue or starch; dampen your print a little and put it on the glass, picture side up. When dry, the print will be stretched nicely on the sheet of glass. The glass should be a little larger than the desired picture, for the reason that when colored and completed it is cut off from the glass. Having your print in this condition, stretched on the glass, it is to be very brilliantly colored in water colors. Altogether the picture presents a dark, strong, brilliant effect. Lay this, glass and picture, upon a flat slab of soapstone—of course, the picture side up—and gradually heat the soapstone on a gas or oil stove until the plate is hot enough to melt wax. Now break a cake of white wax (not paraffine) in two, and rub the surface of the picture with the wax, which gradually melts and saturates the picture. Your picture at this stage looks very much like a "gone goose." Now cut it very carefully at the edge with a sharp knife and lift the picture off from the glass; you will then have a translucent picture. Now heat a sheet of white plate glass in the same manner as you did the other, and when hot lay your wax, face down, upon the glass; it will soon melt and adhere to the glass. With a piece of wax (the sharp edge of the wax used as a squeegee) rub out the air bubbles. So soon as this is done, pick up your glass and let it cool. Now put drops of wax around on the picture to keep the cardboard from absolute contact with it, and put a piece of cardboard behind it, and you have the prettiest picture on earth.—*Anthony's Photo. Bulletin.*

Malaria.

Dr. H. M. Clark has printed a memoir of his experience with malaria during a residence of nine years in India. How formidable a barrier to civilization malaria is may be inferred from the fact that to this disease alone is attributable not less than half the deaths throughout the world. It is not confined to rich, low-lying soils, but is found even in sandy deserts devoid of any vegetation. Once it finds a lodgment in the system, it cannot be wholly eradicated, and it is beyond the reach of acclimatization. Only two races are proof against it, the negroes of the grain coast of

Western Africa and the Taurus of Northern India. Modern medicine and sanitation are equally powerless in dealing with it.

In some places in India, where the cities and towns are built in defiance of all the rules of health, malaria never is known. As preventives, the doctor suggests the turning of swamp lands into lakes, and the planting of such trees as will retain water and shade the soil. For such purposes the eucalyptus is, therefore, useless; but the plantain and banana should answer well.

THE excavation at Hell Gate reef was attended by 21,000 soundings and 8,000 borings.

RECENTLY PATENTED INVENTIONS.

Engineering.

STEAM ENGINE.—Elijah H. Allred, Randleman, S. C. The cylinder of this engine is supported upon an upright centrally located on a base plate near one end of which is an upright forming a pivotal point for one end of a toggle arm, while at the other end is an upright supporting a pulley and a crank from which extends inwardly another toggle arm, the inner ends of both being connected in the central upright, where they are also connected with the piston rod, the reciprocation of which operates the toggle arms to revolve the crank and driving pulley. Rods connected with the toggle arms actuate the steam and exhaust valves.

STEAM ACTUATED VALVE.—Ernest A. Menking, Pittsburg, Pa. This is a valve of simple and durable construction, designed to prevent undue wear, the main piston valve being completely balanced, so that it requires but a small amount of live steam to actuate the valve. In the cylindrical steam chest slides a main piston valve formed with four pistons in frictional contact with the interior surface of the chest, making four annular spaces in the main piston, the inlet port at all times communicating with two of the spaces, while an exhaust port is at all times in communication with one of the spaces. The valve presents various novel features, and the friction is reduced to a minimum.

LUBRICATOR.—Miles W. White, Brooklyn, N. Y. This is a simple and inexpensive device for feeding oil to high or low pressure steam engines, affording convenient and reliable means for the graduated periodical introduction of lubricating liquid into the steam chest. An oil-feeding cup taps the side of a chamber perforated at its base to receive steam pressure, while a slide block in the chamber is grooved to receive an increment of oil from the cup when in lowered adjustment, and discharge the oil under steam pressure through an aligned passage when the slide block is elevated.

Railway Appliances.

RAIL PUNCH.—Elijah B. Cornell, Philadelphia, Pa. This is a hand implement for punching the webs of rails, etc., and consists of a U-shaped frame having pivoted in the lower ends of its depending arms a transverse screw carrying a female die and a transverse slide carrying a male die, a vertical shaft extending down through the frame being connected at its lower end with the slide to operate it, while transverse and vertical screws engage the upper edge and opposite sides of the rail or bar to be punched. The entire device is very light, so that it may be conveniently carried by a workman, and by the movement of a single lever or its equivalent a hole may be made in the web.

TRAIN TABLE.—Andrew J. Culbertson, San Andreas, Cal. This is an apparatus to facilitate the making up of trains in a train yard. The main track is intersected by a transverse pit in which are mounted independent transversely reciprocating parallel tables, each having a series of tracks parallel with the main track, and adapted to align with it, and each of a length to receive a single car, whereby a whole train may be made up by a single shifting of the respective tables. Each table has a piston and cylinder, the latter connected with a fluid pressure supply pipe, whereby power may be readily applied to slide the table in either direction.

AUXILIARY CAR MOTOR.—William H. Schollhoff, Chester, Pa. This is a spring motor to be connected with any car axle, and especially adapted for use on cable cars, to enable the cars to cross another cable, or to change from one cable to another, or to a side track, or it may be used on electric cars where the circuit is broken. The spring is wound up by the movement of the car, and automatic means are provided for throwing it out of gear with the axle when fully wound up. Provision is also made for the prevention of any breakage on account of the negligence of gripman or cableman. The spring is designed to be strong enough to move the car some little distance, and obviate the necessity of employing horses for making such transfers as animal power is sometimes employed for on cable or electric roads.

Mechanical.

BOILER FLUE EXPANDER.—Leopold Biddle, Raton, New Mexico. This is a roller expander in which the roller casing is formed with an apertured end and provided with longitudinal slots to receive the rollers, an apertured cap screwing in the head of the casing abutting against the ends of the rollers to hold them in place within the casing and to take up the strain. The device is of simple and durable construction and is arranged to reduce the wear and tear of the tool to a minimum.

MACHINE FOR FORMING ORNAMENTS.—Louis A. Eucker, Hoboken, N. J. This machine is designed primarily to mould ornaments from glass or other substance, either pliable when cold or when heated, and secure to the ornaments at the time they are formed a shank of wire or other material, cutting the shank to the proper length. Combined with dies, one of which is movable toward and from the other, is a clamp for holding the wire carrying the material to be acted upon by the dies, and means for operating the clamp from the movable die. The machine is designed to make cleaner and quicker work than heretofore possible, as the dies or moulds are nearer the fire and well above and at one side of the table of the machine, enabling the operator at all times to conveniently note the progress of the work.

Agricultural.

PLOW.—John T. Lucas, Centerville, Washington. This is a gang or cultivator plow, the frame of which is of strong and simple construction, and permits of the shares being quickly and conveniently attached and readily reversed. Means are provided for regulating the depth that the shares shall enter the ground, and the rear or guard wheel may be locked to

travel in a straight line only, or be unlocked so that it will have a swivel connection with the frame, thus enabling the implement to be turned around square corners or squarely around. The shares may be readily elevated from the ground when the plow is to be taken away from the field.

CORN HUSKING MACHINE.—Augustus Smith, Scotland, South Dakota. A machine which snaps the corn from the stalk and then rapidly and effectively husks it has been devised by this inventor. A gatherer and separator mechanism is supported at the front end of a main frame carried on wheels, there being husking devices at the rear end of the frame, and the two being connected by an elevator which carries the separated corn ears to the husker. The husking mechanism comprises an open bottom trough-like chamber with side walls formed of corrugated rollers arranged longitudinally and in a plane parallel to the feed. The husked ears are discharged into a box on the under side of the husker.

Miscellaneous.

DUMPING BUCKET.—James A. Quinn, Brooklyn, N. Y. The scoop sections of this bucket are united by a pivot bolt surrounded by rings connected with the sections by chains of a length calculated to maintain the rings out of engagement with the bolt when upward tension is exerted, so that when the bucket is elevated no strain is brought upon the pivot bolt, and the sections may be opened and closed with equal facility under all conditions.

DUSTING APPARATUS.—Lewis F. Neal, Waltham, Mass. A revolvable brush is held in a casing attached to a hose connected with an exhaust apparatus, the casing containing also a wind or fan wheel operating the brush by the air drawn through to the exhaust apparatus. The device is designed to stir up dust or other matter and draw it away by suction, and it may also be used for brushing furs, fabrics, and the like, or for removing drudgery from the head, etc.

PIPE FITTING.—John McIntyre, Jersey City, N. J. A coupling has a threaded connection with a follower provided with a second thread adapted to be engaged by the pipe to be coupled, while a packing ring having an interior and exterior screw thread is arranged between the coupling and follower, so that the latter on being screwed up compresses the packing ring on the coupling and the pipe to be coupled. The packing ring is compressible, and has screw threads engaging simultaneously the screw threads on the follower or the coupling and that of the pipe.

EXTENSION TABLE.—Achilles R. Stebbins, Watertown, Pa. A substantial and durable table which may be made into a variety of sizes and shapes to fit in any desired part of a room, or to conform in size and shape to the necessities of a family, has been provided by this inventor. It has extensible wings at right angles to each other, folding supports extending from the outer end of one wing to the outer end of the other, the supports folding in the middle and having a central leg, and the supports carrying supplemental leaves between the wings. The invention also covers various other novel features.

STEP LADDER AND BENCH.—Ensign B. Stebbins, Lake View, Mich. This is a combination household article, the bench being adapted to support wash tubs and other articles, while the step ladder formed is very solid and stable, the change being readily and conveniently made from one to the other.

PENCIL.—John J. Gillespie, Colorado Springs, Colorado. This is an improvement in pencils in which the lead may be adjusted as it is worn down, and will not have to be sharpened. The improved pencil has a bored body with a longitudinal slot, and a slide or sleeve within the bore having a laterally projecting clamp to engage the interior of the body and prevent retraction, with an extension through the slot for moving the slide toward the point of the pencil.

BOTTLE CORKING TOOL.—Karl Kirschner, Jr., Radlic, near Prague, Austria-Hungary. This inventor has provided a tool for lead stamping or sealing bottle corks, provided with punching surfaces adapted to impress marks on the ends of a lead wire, with a gauge plate on one side against which one end of the lead wire abuts and a knife on the opposite side which cuts off a suitable length of the wire. A lead stamp or steel may thus be affixed which will surely indicate when the bottle has been opened.

LACE FASTENER.—Alexander Klinger, Telluride, Col. This invention relates to fasteners for shoes, gloves, corsets, bags, etc., in which two disks or buttons lying near each other serve to hold by friction the fastening end of the lace. The device is mainly made up of upper or outer and lower or inner buttons corrugated on their approximate faces, a central square or angular post between them, and crossing bar springs on the under or back side of the device, applied to the post.

CABLE PROTECTOR.—Albert W. Lackey, Gold Hill, Nevada. Metallic cables used in mines for raising buckets, propelling cars, etc., are, according to this invention, afforded a protection for their surfaces consisting of a staple whose two prongs are to be driven into the cable, and having a large concave head adapted to fit snugly on a strand of the cable. A series of these staples is driven into the cable, and their heads prevent the rubbing of the cable itself on the flanges of the pulleys or drums over which the cable passes.

PRESERVING FRUITS, ETC.—Milledge B. Wever, San Antonio, Fla. The preserving of citrus fruits, such as oranges, lemons, limes, and grape fruit, and also fruit and vegetables containing a trace of silica, as the apple, cucumber, egg plant, etc., are especially contemplated by this improved method, which provides a means by which they may be kept perfectly fresh for a long time, as to taste, smell, and color. The method consists in packing the fruit in an air-tight box between layers of oiled cotton batting, and covering the contents of the box with a sheet of rubber. The box should have an orifice in one side to allow of escape of moisture after packing, after which the opening may be closed by wax or a suitable seal.

FAN ATTACHMENT.—George W. Grimes, Murfreesborough, N. C. This improvement provides a means of operating a fan by a rocking chair, to fan a person in the chair or one lying in a bed. The fan is suspended by means of a hanger from a bracket secured to the ceiling, and the fan is connected by a cord with a spring bar on the back of the chair, the rocking of the chair then vibrating the fan back and forth. The hanger can be placed at any desired location, and may be readily adjusted as to height.

BICYCLE SADDLE.—Edward S. Cross, Elyria, Ohio. This is a simple and inexpensive saddle in which the spring is formed of a forward and rearward section, arranged to overlap, and held to adjusted positions by a single clip device, which is also adapted to be attached to the seat bar. The arrangement is such that the forward spring reinforces the rear spring against any unusual strain.

CLOTHES POUNDER.—George W. Ainsworth, Montpelier, Vt. This pounder has on the lower end of its handle an outer inverted funnel, within which is an inner funnel or convex disk, the funnel and disk each having numerous perforations, and both being connected by the handle. The arrangement of the funnels is designed to facilitate the quick cleansing of the clothes by the pounder, without danger of tearing them.

SHAFT TUG.—William F. Sweet, Webb's Mills, N. Y. This tug is so made that its inner or wearing surface may be readily changed in position, presenting fresh portions of the leather to the friction of the shafts or thills. The tug strap is adjustable in length to adapt it for any size of thill, and by means of the improvement a much longer use than usual of the tug strap is attained, the surfaces becoming worn being moved out of contact with the shaft.

BED SLAT SUPPORT.—George Luppert, Williamsport, Pa. A slat-supporting bar on the side rail is, by this improvement, held in a series of spring supports, each formed of a stout wire bent to form a wide ball with a spring coil in each vertical portion, and a hook at the upper end to enter the rail. With this support the slats can be quickly placed in position, their accidental displacement is almost entirely avoided, and the resilient properties of the springs are uniformly distributed over the entire bottom.

AXLE NUT.—Joseph Berner, Middle Village, N. Y. This invention relates to an improvement on a formerly patented invention of the same inventor, providing a nut which may be quickly and conveniently locked upon the axle without the locking mechanism being seen. The interlocking portions of the axle and the nut are so shaped that the two may be quickly engaged and disengaged, and when brought into locking position they cannot be accidentally separated.

BATH.—George Elliott, New York City. This is an improvement in portable cabinet baths in which a pump is located in a water-holding receptacle at the bottom, and operated by the occupant of the bath to force water into spray pipes in its upper portion. The casing is preferably made in two sections united by water-tight connections, and by working the pump lever the water is forced into a dome, flowing from thence to various pipes which afford top and cross sprays, as well as through two flexible spray pipes for use as desired.

PORTABLE FENCE.—Henry Knee, Kent, Pa. This is a portable and reversible fence, with batten strips and cross bars, and swiveling eye bolts connecting the horizontal bars to the end posts pivotally, to permit of reversal and adaptation to a hill side. The hooks connect the swiveling eye bolts on the outside of the bend in the fence, and the locking bars are arranged on the inside. The fence panels may be turned upside down and adjusted with equal facility in either way to form a strong and substantial fence.

FENCE POST.—William H. Hunt and Charles O. Morris, Trenton, N. J. This post is made of T-iron, with its shank member having a series of recesses in its outer edge, each recess having an upper curved channel extending downwardly and inwardly, a lower curved section meeting the channel and extending diagonally beneath it, while spurs are formed in the channels. The post is especially adapted for use as an intermediate post in building wire fences, and is very light and durable, and may be readily driven into the ground.

PETROLEUM CASK.—John D. Sprunt, London, England. This is a non-collapseable receptacle, consisting of a rigid frame of wood or other light material, with a flexible side of parchment or glued paper that will yield to the contraction and expansion of the contents of the vessel, the surfaces being coated with glue to close the joints and render the material impervious. There is an aperture for filling and discharging in combination with a collapsible funnel. The receptacle is especially suited for liquids of a penetrating nature.

Designs.

EMBROIDERY FABRIC.—Julius Frelloehr, New York City. Braids or strips form the background of this design, and they are ornamented on top with a raised network of individual threads in zig-zag line, the crossing angles forming small figures.

SPOON.—Charles Otero, Pueblo, Col. The handle of this spoon represents a hammer around which is draped a flag, the end having a medallion female portrait on one side and on the other a mountain view, while in the bowl is a representation of the Colorado mineral palace casket.

SPOON.—Charles Barclay, Lead, South Dakota. The handle of this spoon has on its outer end a marine view, with a sailing vessel and rising sun, while in the foreground is the figure of an Indian as if watching the vessel.

COVERED DISH.—Robert L. Johnson, Hanley, England. This dish is elongated and has a flattened base, and at its ends are outwardly curved handles ornamented with leaf-like scrolls, the cover fitting between the handles and its edges overhanging the

sides of the dish. The edges and knob of the cover have scroll-like ornamentations.

SHOW STAND.—Alben L. Yearous, Eagle Grove, Iowa. Upon a suitable base is a post having marked divisions of decreasing size separated by cylindrical portions from which radiate arms, each arm carrying a series of pendent hook-like figures.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

COMMON SENSE HEALTH NOTES. By A. R. Horne, D.D. Chicago: A. Flanagan. 1893. 12mo. Pp. v, 305.

Contains many useful suggestions for realizing and then maintaining good health.

NAPOLÉON: A DRAMA. By Richmond Sheffield Dement. Chicago: Knight, Leonard & Co.

The author has sought here to portray some of the leading spectacles of Napoleon's life in a form suitable for scenic representation and acting on the stage. A work so ambitious would be really a very great accomplishment, if successfully carried out, but its success on the stage is yet to be achieved.

The Peter Adams Company, of New York City, manufacturers of American art papers, have just issued a beautiful volume of specimens of their different kinds of paper, with artistic printing of various classes on the special kinds and qualities of paper made for each class of work. Printers and publishers getting out fine work will do well to examine these specimens.

"The Book of the Fair," of which Part I. has just been published by the Bancroft Company, of Chicago and San Francisco, promises to be one of the richest and completest of the many more or less elaborate publications projected in this field. It is a large quarto, on heavy calendered paper, of a quality well adapted to bring out the details of the many half-tone and other engravings with which its pages are richly embellished, and the text is in fine, large, beautiful print, with generous margins. It is designed to be "in the strictest sense a work of art, as well as of material and moral instruction," and the reputation of its author, Mr. Hubert Howe Bancroft, affords a good guaranty that it will well come up to such promise. The parts are furnished at one dollar each.

SCIENTIFIC AMERICAN BUILDING EDITION.

JULY, 1893.—(No. 93.)

TABLE OF CONTENTS.

1. Elegant plate in colors, showing the handsome residence of S. E. Walton, Esq., at Springfield, Mass., at a cost of \$10,000 complete. Floor plans and perspective elevations. A pleasing design.
2. Plate in colors showing the residence of Wm. H. Fitzgerald at Bridgeport, Conn., erected at a cost of \$6,000 complete. Two perspective views and floor plans. J. W. Northrop, Esq., architect, Bridgeport, Conn. An attractive design.
3. A dwelling recently erected at Chester Hill, N. Y. Perspective view and floor plans. A model design. Cost \$6,850 complete. Messrs. Munn & Co., New York City.
4. A Colonial modern dwelling recently erected at Montclair, N. J., at a cost of \$5,500 complete. Floor plans, two perspective views, etc. Messrs. Munn & Co., architects, New York. An excellent design.
5. Engraving and floor plans of two designs of cottages recently erected for Mr. D. H. McKay, at Boston, Mass., at a cost of about \$1,600. A. W. Pease, architect, Boston, Mass.
6. Floor plans and engravings of a stone residence erected for George W. Childs, Esq., at St. David, Pa. A very attractive design. Cost \$7,600 complete. Messrs. F. L. & W. L. Price, architects, Philadelphia, Pa.
7. An old colonial style dwelling at Belle Haven, Conn. Floor plans and perspective elevations. A picturesque design.
8. A residence at Belle Haven, Conn. A unique design. Perspective elevation and floor plans. Messrs. Boring, Tilton & Mellin, architects, New York City.
9. Bird's-eye view of the World's Columbian Exposition—looking West.
10. The Fifth Avenue Theater, New York.—View showing the orchestra chairs and seating arrangement. Mr. Francis H. Kimball, architect, New York.
11. Miscellaneous contents: A change in name.—A tufted metal ceiling, illustrated.—Hanson's automatic boiler feed, illustrated.—Simple means of raising water to house tanks, illustrated.—Copper statue, "Flying Dutchman," at the Columbian Exposition, illustrated.—Naphthalene as a timber preservative.—Ornamental parquetry floors and borders, illustrated.—An improved wood working machine, illustrated.

The Scientific American Architects and Builders Edition is issued monthly. \$2.50 a year. Single copies, 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages; forming, practically, a large and splendid MAGAZINE OF ARCHITECTURE, richly adorned with elegant plates in colors and with fine engravings, illustrating the most interesting examples of Modern Architectural Construction and allied subjects.

The Fullness, Richness, Cheapness, and Convenience of this work have won for it the LARGEST CIRCULATION of any Architectural Publication in the world. Sold by all newsdealers.

MUNN & CO., PUBLISHERS,
361 Broadway, New York.

Cotton gin saw, W. M. Brown.	500.
Cotton treating, H. Anthony.	500.
Coupling. See Car coupling. Hame coupling.	
Hose coupling. Thill coupling.	
Cream separator, J. J. Berrigan.	501.
Creamer, centrifugal, J. J. Berrigan.	501.
Creamer, centrifugal, N. G. Williams.	501.
Crib, C. W. E. F. Felt.	501.
Crushing machine, R. McCully.	500, 506
Cultivator, C. Aulser.	500.
Cultivator, D. E. Barton.	500.
Cultivator, C. T. Eldredge.	500.
Cultivator, wheel, E. A. Couch.	500.
Currents, method of and means for producing al-	
Cut-out, safety, O. O'Neill.	500.
Cutter. See Band cutter. Bolt cutter. Weed	
cutter.	
Cyanides and ammonia, method of and apparatus	
for producing, T. B. Fogarty.	500.
Cycle mud guard, C. E. Hadley.	500.
Cycle mud guard, W. E. Perkins.	500.
Cycles, construction of, J. M. & W. Starley.	500.
Dash, carriage, C. A. Behlen.	500.
Dash, vehicle, C. A. Behlen.	500.
Desks, device for operating the slides or rests of,	
J. B. Pooley.	500.
Disinfecting device, H. L. Bennett.	500.
Disintegrator, C. E. Leonard.	500.
Display frame, W. O. Rogers.	500.
Display rack, C. Frankel.	500.
Display stand, M. Anthony.	500.
Doll heads, apparatus for moulding, Vallee &	
Schultz.	500.
Door, grail, J. Sheridan.	500.
Douching apparatus, S. L. Hall.	500.
Draft equalizer, G. Jones.	500.
Drapery hook and pin, F. S. McKenney.	500.
Draw-bar attachment, Walker & Bedford.	500.
Drawer slide and extension support, V. R. Har-	
vey.	500.
Dress apparatus, J. Price, Jr.	500.
Dress shifter, H. Moschowitz.	500.
Dress stiffeners, machine for making, I. D. War-	
ner.	500.
Drier. See Laundry drier.	
Drilling machine, multiple, D. E. & L. E. Whiton.	500.
Drivings wheel, D. E. Munsh.	500.
Dust, sealing floor, D. E. Munsh.	500.
Dye, red azo, Green & Lawson.	500, 761
Dye, violet red, L. Lifschutz.	500.
Ear piece, R. Seiffert.	500.
Earthenware, liquid material for the manufacture	
of fine, J. Klieber.	500.
Electric appliances, J. E. Von Tassel.	500.
Electric currents, method for alternating pulsating	
or intermittent, T. Duncan.	501.
Electric ignitor, W. F. West.	500.
Electric machines, brush holder for dynamo, H.	
G. Reist.	500.
Electric motor, J. MacHaffie.	500.
Electric switch, J. E. Thomson.	500.
Elevator gate, Lagerquist & Nelson.	500.
Elevator safety device, N. V. Fitts.	500.
Emery wheel, J. R. & A. M. Carpenter.	500.
Engine. See Gas engine. Rotary engine. Steam	
engine.	
Engine, reversing gear, Whittington & Fishing.	500.
Engines, combustion chamber for petroleum or	
hydrocarbon, Richardson & Norris.	500.
Engines, oil-supplying device for hydrocarbon,	
Richardson & Norris.	500.
Engines, rock arm for horizontal, E. J. Arm-	
strong.	500.
Envelope, J. M. Cutter.	500.
Feed roll, sectional, R. M. Gleason.	501.
Feed water regulator, C. H. Gersting.	500.
Fence post, J. B. Gowdy.	500.
Fence post, C. H. Van Wagoner.	500.
Fertilizer distributor and grain drill, L. I. & J. M.	
Fleming.	500.
File, paper, W. H. Aibes.	500.
Filter and cooler, F. E. Cady.	500.
Fire lighter, automatic, J. L. Cutter.	500.
Fires draw, etc., device for making, C. B. Stuart.	500.
Fireplace frame, H. G. Dawson.	500.
Flood gate, H. H. Eatherton.	500.
Fluid compressor, W. Resner.	500.
Folding chair, coin-freed, J. O. Tonkin.	500.
Frame. See Awning frame. Display frame. Fire-	
place frame.	
Fruit picker, J. Swanburg.	501.
Fuel, artificial, M. Nirdlinger.	500.
Furnace. See Hot-air furnace. Heating furnace.	
Hot-air furnace.	
Furnace, J. T. Jenkins.	500.
Furnaces, gas burner for boiler, C. T. Sloan.	500.
Gage. See Measuring machine gage.	
Gaine, A. M. Grubb.	500.
Gas, gas dispensing machine, H. B. Arnold.	500.
Garment supporter, D. H. Warner.	500.
Gas burner, natural, W. G. Taylor.	500.
Gas burner, self-generating, H. F. Smith.	500.
Gas engine, F. Cordenons.	500.
Gas generator, J. Nolan.	500.
Gasoline, method of and process of obtaining	
combined nitrogen and fuel, T. B. Fogarty.	500.
Gate. See Bridge gate. Flood gate. Elevator	
gate.	
Ga e, W. K. Mills.	500.
Generator. See Gas generator. Steam generator.	
Glass. See Opera, field, marine, and other glass.	
Glass bottles. Finishing tool for, Sheldon &	
Lynn.	500.
Glass decorating apparatus, J. Macher.	501.
Grain binder, C. Colahan.	500.
Grain binder, G. L. Phelps.	500.
Grain drill, J. A. M. Tyler.	500.
Grain elevator, J. N. Darr.	500.
Gravity helmet, J. F. Corker.	500.
Guard. See Cattle guard. Hatchway guard.	
Cycle mud guard. Penholder guard.	
Guitars. Adjustable tail piece for, F. A. Inger-	
son.	500.
Gun, breechloading, J. Rider.	500.
Guns, breechloading, J. M. Rider.	500.
Guns. Hydraulic recoil brake for, A. Kampf.	500.
Hame coupling, A. A. Parsons.	500.
Hammer. Forging, A. Sperl.	500.
Hammock, J. Shinn.	500.
Hand press, W. S. Kisinger.	500.
Harness, J. N. Darr.	500.
Harrow, W. J. Lawrence.	500.
Harvest extension device, T. Sampson.	500.
Hat, I. Shepard.	500.
Hat, coat, and umbrella rack, E. W. Trout.	500.
Hatchway guard, C. J. Reynolds.	500.
Hay or hog rack, W. H. Long.	500.
Hay stacker, G. C. Soehs.	500.
Heater. See Water heater.	
Heater flue register, W. H. Meyers.	501.
Heating apparatus, G. L. Shorey.	501.
Heating furnace, W. P. Winner.	501.
Heel, M. Murray.	501.
Holdback, C. C. Edmunds.	501.
Hook. See Crapery hook. Whiffletree hook.	
Lacing hook.	
Hoop fastening. Barrel or other, E. W. Beazell.	500.
Horse blanket strap, A. P. Russell.	500.
Horseshoe, D. Gindold.	500.
Horseshoe, N. Galleas, S. Pruden.	500.
Hot air coupling. Electric, C. Strauss.	500.
Hot air furnace, C. C. Soehs.	500.
Ice boat. Oar-propelled, G. H. Thacher.	500.
Ice machine, G. F. Knox.	501.
Ice shedder or shaver, T. Mabbett.	500.
Induction coil. Coin operated, W. R. Pope.	500.
Injector, F. Brubaker.	500.
Insulator, J. E. Stank.	501.
Inkstand. Fountain, E. C. Mayloy.	500.
Insulating coupling, L. McCarthy.	501.
Insulator. Conduit railway, G. E. Noyes.	500.
Intersecting mitre, M. Gates.	500.
Iron. See Sad iron. Soldering iron.	
Jack. See Lifting jack. Wagon jack. Screw	
jack.	
Jewel-setting machine, W. Rundquist.	500.
Journal box, G. W. M. Bowen.	500.
Keyhole guide, C. Taylor.	500.
Knitting machine. Straight, W. T. Rowlett.	500.
Lacing hook, W. B. H. Dowse.	500.
Lamp. Electric arc, C. B. Rhind.	500.
Lamp. Electric arc, R. M. Hunter.	500.
Lamp. Electric arc, W. A. Turbayne.	500.
Lamp. Electric incandescent, Burnett & Doane.	500.
Lamp globe. Incandescent, T. B. Atterbury.	500.
Lamp. Incandescent electric, W. E. Nickerson.	500.
Lamp. Incandescent electric, Nickerson & Cary.	500.
Lamp. W. E. Nickerson.	500.
Lasting machine, J. T. Avery.	500.
Lathe attachment, J. E. Richards.	500.
Lathe. Metal turning, T. Coldwell.	500.
Laundry drier, A. V. M. Sprague.	500.
Leather skiving machine, A. J. Allen.	500.
Lever and sand, W. Falconer.	500.
Lifting jack, A. H. & C. Alderman.	500.
Lightning arrester, W. A. Turbayne.	500.
Lightning arrester, C. S. Van Nuis.	500.
Linoleum or oil floorcloths. Manufacturing, J. C.	
Lyon.	500.
Liquid goods. Receptacle for carrying, G. Pe-	
relli-Minetti.	500.
Liquid goods. Receptacle for carrying, G. Pe-	
relli-Minetti.	500.
Liquid goods. Receptacle for carrying, G. Pe-	
relli-Minetti.	500.
Lock. See Nut lock. Railway switch lock.	
Lock, G. E. Tyson.	500.

(5178) T. H. DeS. asks: 1. Will you kindly tell me how to make a spark coil? I am putting up in my bedroom an automatic electric gas burner and want spark coil for igniting gas. Kindly state of what the core should be made. A. No. 18; or No. 20 soft annealed iron wire. 2. Name diameter and length. A. $\frac{3}{4}$ of an inch in diameter and 8 inches long. 3. What number (Am. w. gauge) of cotton-covered wire should the core be wound with? A. No. 18. 4. State the quantity of wire required for winding. A. Use enough of the magnet wire to make the depth of the winding about equal to the diameter of the core. This will probably require about 2 pounds.

Stove, gasoline or vapor, H. Ruppel.....	500,747
Stove, Oil, L. Block.....	500,751
Stove, gas, J. W. Jones.....	500,913
Stovepipe fastener, E. W. Mohr.....	500,697
Stoves or soldering apparatus. Burner for cooking, J. V. Svenson.....	500,781
Strap. See Horseblanket strap.....	
Street sprinkler, C. A. Clark.....	500,883
Street sweeper, J. Jones & Gillies.....	500,906
Supply and wastepipe, W. A. Eberhart.....	500,871
Switch. See Electric switch.....	
Switch piece and making it, A. J. Moxham.....	500,930
Table. See Railway transfer table.....	
Telephone system, G. L. Anders.....	500,545
Thill coupling, J. W. Hoddinott.....	500,806
Thill coupling, J. W. Hoddinott.....	500,709
Ticket stamping and cutting machine, R. Busek.....	500,797
Tiles. Frame for illuminating, H. Haustein.....	501,008
Tinning machine, Norton & Hodgson.....	500,718
Tire. Pneumatic, R. W. Huss.....	500,658
Tire. Pneumatic, G. Fickel.....	500,948
Tire. Pneumatic, R. W. Huss.....	500,689
Tobacco stripping and booking machine, J. R. Williams.....	500,647
Tool. Combination, J. D. Barnett.....	500,551
Tool holder, F. E. Youngs.....	500,834
Toy, C. S. Edwards.....	500,587
Toy, C. S. Edwards.....	500,587
Toy vehicle, F. H. Harris.....	500,805
Track cleaner, G. W. Ruggles.....	501,028
Track sanding device, A. & E. C. Goldsmith.....	500,882
Traction wheel, A. G. Rose.....	500,811
Truck, Lund, G. Lillie.....	500,906
Truck, Lumber, H. Daniels.....	500,860
Trunk boxes, etc. Manufacture of, H. Krammer.....	500,912
Truss, W. Danz.....	500,739
Tubing. Flexible metallic, W. H. K. Bowley.....	500,947
Tubing. Steam gauge, C. A. G. Winther.....	500,880
Tubular frame construction, A. Perkins.....	500,885
Turn buckle, W. H. Albach.....	500,836
Type wheels. Die for making, F. Hcaubert.....	500,801
Type writing machine, W. Clark.....	500,736
Valve. Automatic relief, W. F. West.....	500,645
Valve operating device for gas heaters, A. T. Williams.....	500,648
Valve. Relief, A. L. Harrison.....	500,891
Vegetable chopper, C. B. Trumble.....	500,895
Vehicle running gear, J. Urbanek.....	500,980
Vehicle spring seat, J. A. Alexander.....	500,789
Vehicle wheel, M. Burgess.....	500,708
Vehicle. Driving mechanism for road, A. C. Williams.....	500,544
Veil clasp, C. M. Day.....	500,834
Velocipede. Ice, A. Karlson.....	500,583
Velocipede. Ice, D. Smith.....	500,633
Ventilator. See Apartment ventilator.....	
Veterinary operating table, W. J. Magee.....	500,588
Voice coupling apparatus, W. G. Richards.....	500,948
Wagon jack, Z. L. Palmer.....	500,940
Wagon or cart, Read & Hager.....	500,612
Wall facing, D. F. Saum.....	501,029
Warp threads. Harness supporting and heddle eye selecting device for machines for drawing in, L. P. Sherman.....	500,985
Warp threads. Needle operating and reed dent separating device for machines for drawing in, L. P. Sherman.....	500,984
Warp threads. Thread selecting device for machines for drawing in, L. P. Sherman.....	500,986
Watch bow fastener, L. Platnauer.....	500,817
Water carrier, J. Winterlood.....	500,763
Water carrier. Highland, Northway & Hammond.....	500,936
Water conductors to buildings. Device for attaching, O. Rosenquest.....	500,616
Water cooler, E. T. Green.....	501,007
Water cruet, Eucharistic, L. C. Baudet.....	500,843
Water heater, J. Winterlood.....	500,857
Water heater. Fireplace, A. Bergbold.....	500,654
Waterproof fabrics. Manufacturing, G. C. Mandelberg.....	500,684
Washing machine, A. P. Anderson.....	500,846
Weather strip, M. Bradford.....	500,946
Weather strip, J. Winterlood.....	500,758
Weather strip, Green & Wesselowski.....	500,885
Weed cutter, etc., W. A. McCoy.....	500,982
Welding machine, electric, M. M. Suppes.....	500,973
Wheel. See Driving wheel. Emery wheel.....	
Wheel. Traction wheel. Vehicle wheel.....	
Wheel, F. C. Hockensmith.....	500,578
Wheel, F. C. Hockensmith.....	500,915
Whiffletree hook, G. C. Edmunds.....	501,002
Windmill, W. Kouns.....	500,911
Windows, metallic setting for stained glass, G. B. Lee.....	500,884
Wood embossing machine, S. L. Davis.....	500,738
Wrench and wheel after combined, J. Koberstein.....	500,800
Wringer. See Clothes wringer.....	
Yarn drying machine, Tymeson & Ducros.....	500,684

TRADE MARKS.

Baking powder, W. F. McLaughlin.....	23,292
Beer, lager, Henn & Gabler Brewing Company.....	23,300
Bicycles and tricycles and parts thereof, Black Manufacturing Company.....	23,292
Bitters, emulsions, cough mixtures, sarsaparilla, and other preparations, J. H. Smith.....	23,311
Butterine, Swift & Company.....	23,294
Candles, certain, Phoenix Candle Company.....	23,298
Capsules, antiseptic uterine lotion, and laxative tablets, vaginal, J. A. Miller.....	23,311
Cigarette paper, A. Badie & Company.....	23,300
Cigarettes, certain, National Cigarette and Tobacco Company.....	23,307
Collyrium employed as a remedy for the eyes, R. Hudnut.....	23,310
Dress trimmings, Dreyfuss & Toif.....	23,298
Flour, wheat, Northwestern Consolidated Milling Company.....	23,290
Flour, wheat, W. H. Stokes.....	23,294
Hams and pork meat, Edward Heitzberg Packing and Provision Company.....	23,292
Hardware, including locks and latches, builders', Reading Hardware Company.....	23,292
Herrings and cods, Yermans & Co.....	23,294
Hot and cold heaters, Richardson & Boynton Company.....	23,292
Insect exterminating compound, Watson, Erwin & Co.....	23,292
Lard and butter, substitute for, Armour & Co.....	23,292
Matches, Oshosh Match Works.....	23,292
Medicine, pills, liver and kidney, Lincoln Pill Company.....	23,311
Mirrors, plate glass, R. A. Schlegel & Bro.....	23,292
Oil, lubricating, Abbott Cylinder Oil Company.....	23,298
Perfumery, C. L. Cotton.....	23,295
Perfumery, toilet soaps and cosmetics, Blondeau & Co.....	23,298
Perfumery, toilet soaps and cosmetics, Blondeau & Co.....	23,298
Pianos, McCammon Piano Company.....	23,292
Remedies for coughs and colds, H. H. Stoddard.....	23,311
Remedies for gonorrhea, gleet, etc., Pease & Johnston.....	23,311
Remedy for coughs, colds, catarrh, etc., sirup, M. P. Hahn.....	23,311
Remedy for kidney and liver complaints, Herbaline Medicine Co.....	23,311
Remedy for rheumatism, G. A. Lehman.....	23,311
Remedy for the tobacco habit, U. Stackhouse.....	23,311
Salts, P. E. H	



**A
NEW
CAMERA**

THE PREMO

Fitted with all improvements for hand or tripod work, including swing-back and adjusting front, yet without

EXCEEDINGLY COMPACT.

It is the ideal Camera for Tourists, Bicyclists, Canoeists, and all others to whom a saving in space is an important consideration.

Full particulars in our new catalogue—mailed free.

ROCHESTER OPTICAL CO.

14 So. Water St., ROCHESTER, N. Y.

Founded by Mathew Carey, 1785.

HENRY CAREY BAIRD & CO.
Industrial Publishers, Booksellers, and Importers,
810 Walnut St., Philadelphia, Pa., U. S. A.
Our new and Revised Catalogue of Practical and Scientific Books, 88 pages, 8vo, and our other Catalogues and Circulars, the whole covering every branch of Science applied to the Arts, sent free and free of postage to any one in any part of the world who will furnish his address.



VANDUZEN STEAM PUMP
THE BEST IN THE WORLD.
Pumps Any Kind of Liquid.
Always in Order, never Clogs nor
freezes. Every Pump Guaranteed.
10 SIZES.
200 to 12000 Gallons per Hour.
Cost \$7 to \$75 each. Address
THE VANDUZEN & TIFT CO.,
102 to 108 E. Second St., Cincinnati, O.

IF YOU HAVE ANY SMALL ARTICLES
in Brass or Iron that you want manufactured
in quantities, write to THE JONES BROS. ELECTRIC CO., 28-30-32 West Court St., Cin'ti, O.

GATES ROCK & ORE BREAKER

Capacity up to 200 tons per hour.
Has produced more ballast, road
metal, and broken more ore than
all other breakers combined.
Builders of High Grade Mining
Machinery. Send for Catalogue.
GATES IRON WORKS,
50 CSo. Clinton St., Chicago
130 C. Liberty Street, New York
237 C. Franklin St., Boston, Mass

Visitors to the

WORLD'S FAIR

should inspect the handsome
Registers, Sunshine Records,
Anemometers, and other Meteor-
ological apparatus on exhibit
in Weather Bureau Building,
from Julien P. Frick, 107 E. G.
St., Baltimore, Md. U. S. A., who
also manufactures Heliographs
for U. S. Army and State Militias.

STEEL TYPE FOR TYPEWRITERS

Stencils, Steel Stamps, Rubber and
Metal Type Wheels, Dies, etc.
Model and Experimental Work.
Small Machinery, Novelties, etc., man-
ufactured by special contract.
New York Stencil Wks. 100 Nassau St., N. Y.

GRAPES: HOW TO KEEP.—METHOD
of preserving grapes by the use of bottles of water and
by water tubes. With 5 illustrations. Contained in SCIENTIFIC
AMERICAN SUPPLEMENT, No. 890. Price 10
cents. To be had at this office and from all newsdealers.

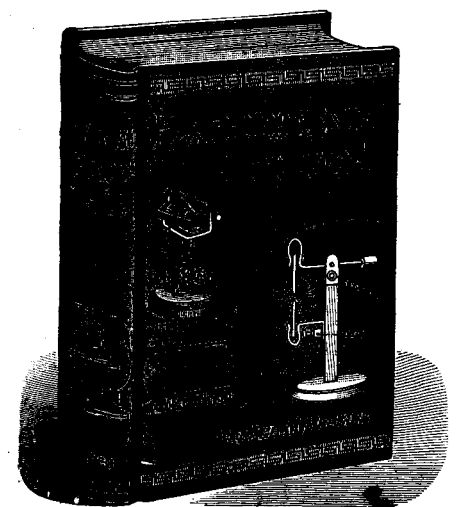
WOODEN TANKS
FOR RAILROADS
LARGE WATER TANKS
FOR MILLS, FARMS, ETC.
COMPLETE STOCK OF
MATERIALS AND
WORKMEN FOR
FOUNDATIONS AND TOWERS.
W. E. CALDWELL & CO.
217 E. MAIN ST. LOUISVILLE, KY.

**ALUMINUM: ITS USES AND AP-
PLICATIONS.** A valuable and interesting article by G. L.
Addenbrooke. Contained in SCIENTIFIC AMERICAN
SUPPLEMENT, No. 859. Price 10 cents. To be had at
this office and from all newsdealers.

FREE
A fine 14k
gold plated
watch to
every reader
of this paper. Cut this out and send it to us with
your full name and address, and we will send you one
of these elegant, richly jeweled, gold finished watches
by express for examination, and if you think it is equal
in appearance to any \$25.00 gold watch, pay our sample
price, \$5.00, and it is yours. We send with the
watch our guarantee that you can return it at anytime
within one year if not satisfactory, and if you sell or
exchange the watch we will give you \$5.00. Write
at once as we shall send out samples for 60 days only.
**THE NATIONAL M.F.C.
& IMPORTING CO.,**
334 Dearborn St., Chicago, Illinois.

NOW READY!

Fourteenth Edition of Experimental Science



REVISED AND ENLARGED.
120 Pages and 110 Superb Cuts added.

The unprecedented sale of this work shows conclusively that it is the book of the age for teachers, students, experimenters, and all others who desire a general knowledge of Physics or Natural Philosophy.
In the new matter contained in the last edition will be found the Scientific Use of the Phonograph, the curious optical illusion known as the Anorthoscope, together with other new and interesting Optical Illusions, the Optical Projection of Opaque Objects, new experiments in Projection, Iridescent Glass, some points in Photography, including Hand Cameras, Cane Cameras, etc.; Systems of Electrical Distribution, Electrical Ore Finder, Electrical Rocker, Electric Chimes, How to Color Lantern Slides, Study of the Stars, and a great deal of other new matter which will prove of interest to scientific readers.
840 pages, 782 fine cuts, substantially and beautifully bound. Price in cloth, by mail, \$4. Half morocco, \$5.
Send for illustrated circular.

MUNN & CO., Publishers,
Office of the SCIENTIFIC AMERICAN,
361 BROADWAY, NEW YORK.



THE "MUNSON" TYPEWRITER.

This machine is an "evolution," the outgrowth of years of experience and the best results of scientific work. Its principles appeal at once to the educated mechanic. It is simple, compact, easily operated, with Universal Key Board.
INTERCHANGEABLE STEEL TYPE WHEEL,
durable and easily kept in order. 30 keys, 90 characters. Weight, with carrying case, 16 pounds. Special wheels for different languages. Send for circular to
THE MUNSON TYPEWRITER CO.,
162 S. La Salle Street, Chicago, Ill., U. S. A.



EDISON PHONOGRAPHS

FOR SALE.
ADDRESS,
North American Phonograph Co.
EDISON BUILDING
New York.
Masonic Temple Bldg.,
Chicago.

Inventions and Novelties Developed.
Manufacturers of Electrical Goods. Experimental and Repair Work. THE N. Y. ELECTRICAL AND DEVELOPMENT CO., 251 William Street, New York.



Has no equal for all machinery bearings. It is used where no other known metal will stand.
THEO. HERTZ & SON, Manufacturers Babbitt Metal Solder, Stereotype and Electrotype Metals, Lead Car Seals, etc., 2335 W. Park Avenue, St. Louis, Mo.

THE SIMPLEX TYPEWRITER

250 **250** **GUARANTEED**
to do as good work as any high priced machine. Specially adapted for use in private correspondence. Sent by mail or express prepaid on receipt of \$2.50. See Sci. Am., Oct. 1, p. 211.
Address Simplex Typewriter Co., 22 Great Jones Street, New York.

\$20 to \$60 Saved on New BICYCLES
A \$9 Victor Jr. for \$18. All makes new & 2d hand; largest & oldest dealers in U. S. Easy Payments if desired. We sell everywhere. Cata. free. **Rouse, Howard & Co.,** Mfrs. 16 GSt., PEORIA, ILL.

LIQ. ID FUEL FOR STEAM MAKING.
—By K. R. Hutton. A paper pointing out the advantages of partially refined and crude petroleum for boiler firing. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 896. Price 10 cents. To be had at this office and from all newsdealers.

After being on the Market Seven Years
THE AGME AUTOMATIC ENGINE AND BOILER
STILL LEADS!
Half to Four Horse Power. Marine and Stationary.
For either Natural Gas or Petroleum as Fuel.
NO EXTRA INSURANCE.
ROCHESTER MACHINE TOOL WORKS, Brown's Race, ROCHESTER, N. Y.

HARRISON CONVEYOR!
For Handling Grain, Coal, Sand, Clay, Tan Bark, Cinders, Ores, Seeds, &c.
Send for Circulars.
BORDEN, SELLECK & CO., Sole Mfrs., Chicago, Ill.

VOLNEY W. MASON & CO.
FRICTION PULLEYS, CLUTCHES, and ELEVATORS
PROVIDENCE, R. I.

Delaney's Metallic Gaskets
and Flanges make everlasting joints. Delaney's Expansion Packings for steam water and ammonia are best and cheapest.
H. J. Delaney & Co., Third & Fowler Sts., Milwaukee, Wis.

Industries-Patents-Capital-Skilled workmen
We locate industries, organize new companies, sell patents, procure capital, find the right place for skilled workmen and partners. Suburbs and towns needing industries should write us.
FINLEY'S INDUSTRIAL BUREAU, Zanesville, Ohio.

AGENTS \$50 to \$100 WEEK.
Ladies or Gents. Best seller known. Needed every house, place of business or farm the year round. "Home" Electric Motor runs all kinds of light machinery. Cheapest power on earth. Connected instantly to wash or sewing machine, corn sheller, pumps, fans, lathes, jeweler's or dentist's machinery, &c. Clean. Noiseless. Lasts a life-time. No experience needed. To show in operation means a sale. Guaranteed. Profits immense. Circulars free.
W. P. HARRISON & CO., Columbus, O.

INVENTORS and Experimentors can obtain valuable assistance from us in perfecting their ideas. Models and patterns a specialty. Write us. **WM. GARDAM & SON** 86 John St., New York.

The name to remember when buying a **BICYCLE** is **A. W. GUMP & CO.,** DAYTON, OHIO.
\$30 to \$50 saved on many new and second-hand Bicycles. Lists free. Over 2000 in stock. Cash or time. Agents wanted.

WE SEND FREE
with this beautiful Organ an Instruction Book and a handsome upholstered stool. The organ has 11 stops, 5 octaves, and is made of Solid Walnut. Warranted by us for 15 years. We only charge \$45 for this beautiful instrument. Send to-day for FREE illustrated catalogue. **OXFORD MFG. CO** Chicago.

PATTERN MAKER, H. VAN SANDS, 144 Centre St., N. Y.

DRILL CHUCKS. Write "THE PRATT CHUCK CO." Clayville, N. Y., U. S. A., for free illustrated catalogue of POSITIVE DRIVING DRILL CHUCKS, showing the only perfect system ever devised for holding and driving drills.

Foreign Agencies: Ph. Roux et Cie, 54 Boulevard du Temple, Paris, France. E. Sonnenthal Jr., Nuev Promenade No. 5, Berlin, Germany. Selig, Sonnenthal & Co., 85 Queen Victoria Street, London, E. C., England.

CELLULOID ZAPON **CELLULOID LACQUERS**
41 BARCLAY ST. NEW YORK. MANUFACTURERS OF CELLULOID LACQUERS

WITH YOUR WORKSHOP EQUIP-

YOUR FOOT POWER
With outfits of Barnes Wood and Metal Working Machinery you can successfully compete with factories that use steam power, both in quality and profit on product. The only complete line of such machines made. Have stood the test twenty years. Send for catalogue. Address: **W. J. BARNES CO.,** 1999 Ruby St., Rockford, Ill.

SINTZ GAS ENGINE CO.
GRAND RAPIDS, MICH., U. S. A.
Manufacturers of the Sintz Stationary and Marine Gas and Gasoline Engines. Especially adapted for Boats and Electric Lighting. Runs with manufactured or natural gas—Boats and launches. Prices within the reach of all. Send for Catalogue. Mention this paper.



PROPOSALS.

SEALED TENDERS WILL BE RECEIVED BY the Government of Newfoundland, addressed to the Colonial Secretary, on or before the 15th day of August next, for a lease of the St. John's First Class Simpson's Improved Dry Dock, and of the harbor works in connection therewith, for a term of ten, fifteen or twenty years. The Dry Dock is 620 feet in extreme length, with a draft of 25 feet of water on the sill at high tide. It is built of concrete, pitch pine and oak, and is in good condition. The property is equipped on one side of the dock with all necessary repair shop and office accommodation, in a brick building 400 feet long, 30 feet wide and 16 feet height of wall. The shop is provided with 1 vertical drill, 1 punch and shears, 1 set plate rolls, electric light plant, and engine and boiler, with necessary shafting. In separate brick building on the same side of the dock is the pumping installation, consisting of two W. H. Allan's 30-inch centrifugal pumps (direct acting horizontal engines) and one 10-inch centrifugal engine, compound, double, vertical, all supplied by a pair of marine boilers. The gate is a floating iron caisson, provided with steam warping capstan and steam ballast pump. Tenders must state term of years proposed, rent and securities for performance of contract. Further particulars may be had on application to me. **R. BOND, Colonial Secretary, St. John's, Newfoundland.**—25th May, 1893.

MALLEABLE AND FINE GRAY IRON ALSO STEEL CASTINGS FROM SPECIAL PATTERNS.
THOMAS DEVLIN & CO., LEHIGH AVE. & AMERICAN ST. PHILA.

Locomotive Catechism. Containing nearly 1,300 questions and answers concerning designing and constructing, repairing and running various kinds of locomotive engines. Intended as examination questions and to post and remind the engine runner, fireman, or learner. By Robert Grimshaw. One vol. cloth, 362 pages, 175 illustrations. Containing a full description, with large folding plate, of the famous engine No. 666, recently built and operated by the N. E. & W. R. R. 7 folding plates. 1893. \$2.00

Metal-Plate Work. Its patterns and their geometry; also notes on metals and rules in mensuration. By C. T. Mills. Second edition enlarged. 377 pages. 1893. \$3.50

Municipal Improvements. A manual of the methods, utility and cost of public improvements, for the municipal officer. By W. F. Goodhue. 12mo, cloth. 1893. \$1.50

Needlework. A text-book of needlework, knitting and cutting out, with methods of teaching. By Elizabeth Roseway. With original illustrations and sectional diagrams. 460 pages. 1893. \$1.75

Photography. Practical pocket-book of photography. A short guide to the practice of all the usual photographic processes for professionals and amateurs. By Dr. E. Vogel. Translated by E. C. Conrad, F.R.S., from the second German edition. With many illustrations and a copious index. 202 pages. Cloth. \$1.00

Public Health. A treatise on public health and its application in different European countries. By Albert Palmberg and Arthur Newsholme. One vol. 8vo, cloth. 182 illustrations. 539 pages. 1893. \$5.00

Pumping Machinery. A practical handbook relating to the construction and management of steam and power pumping machines. By W. M. Barr. With upward of 200 engravings, covering every essential detail in pump construction. 447 pages. Cloth. 1893. \$5.00

Rocks Classified and Described. A treatise on lithology. By Bernhard von Cotta, with English, German and French synonyms. Translated by P. H. Lawrence. One vol. 8vo, cloth. 430 pages. 1893. \$4.50

Soap Manufacture. A practical treatise on the fabrication of hard and soft soaps, and analytical methods for the determination of their chemical composition. By W. L. Gadd. One vol. cloth. 224 pages. Illustrated. 1893. \$1.50

Sound and Music. By Rev. J. A. Zahm, C.S.C., Professor of Physics in the University of Notre Dame. 452 pages. Illustrated. 1892. \$3.50

Star Maps and Luminous Stars. A method for quickly learning the names and positions of the constellations, the movements of the planets, etc. By R. A. Proctor and A. E. Beach. One quarto vol. cloth. 1893. \$2.50

Street Railway Motors. With descriptions and cost of plants, and operation of the various systems in use or proposed for motive power on street railways. By Herman Haupt. One vol. cloth. 213 pages. 1893. \$1.75

Telephone Lines and their Properties. By Wm. J. Hopkins. 258 pages. Illustrated. London. 1893. \$1.50

The Great Barrier Reef of Australia; Its Products and Potentialities. Containing an account, with copious Colored and Photographic Illustrations (the latter here produced for the first time), of the Coral and Coral Reefs, Pearl and Pearl-Shell, Beche-de-Mer, other Fishing Industries, and the Marine Fauna of the Australian Great Barrier Region. By W. Saville Kent. 16 Chromo plates and 48 plates in Photomicrotype. Super-Royal 4to. Cloth. London, 1893. \$30.00

Telegraphic Connections. Embracing recent methods in Quadruplex Telegraphy. By Charles Thorn and Willis H. Jones. One oblong volume. Cloth. 50 pages, 20 plates, colored. \$1.50

FREE.

Our entirely new Catalogue of Scientific and Technical Books, containing over 3,000 titles, and embracing more than 300 different subjects, with Authors' Index, will be mailed free on application to any address in the world. Address

MUNN & CO.,
Publishers of the "Scientific American,"
361 Broadway, New York.

New * Books

The American Ready Reckoner. A new and complete assistant for merchants, mechanics and farmers. For the purpose of showing at a glance the amount and value of any quantity of merchandise, from a quarter of a cent to ten dollars, either by weight or measure. 192 pages. Pocket size. \$25

Alternating Currents of Electricity; their generation, measurement, distribution and application. By Gisbert Kapp. One vol. cloth. 166 pages. 1893. \$1.00

Asphalt. Twenty years' practical experience of natural asphalt and mineral bitumen. By W. H. Delmono. One vol. 73 pages. Illustrated. 1893. \$0.50

Design. Practical Designing. A handbook on the preparation of working drawings. Edited by Gleason White. Elegantly bound in cloth. 12mo. 237 pages. Profusely illustrated. 1893. \$2.50

Dictionary, Standard Electrical. By Prof. T. O'Connor Sloane. 12mo, cloth. 624 pages. 350 illustrations. 1892. \$3.00

A new dictionary of terms in electrical science and allied branches. The definitions cover the meaning and scope of terms, the electrical constants of all conductors and dielectrics, wire gauge tables and elaborately revised or newly calculated tables of equivalents. The work aims to be the most complete and reliable ever published. Synonyms are given after each title. Cross references are freely used. The work really constitutes a cyclopedia of the science, and a valuable addition to even the smallest of electrical libraries.

Drawing. A manual of machine drawing and design. By D. A. Low and A. W. Beers. 375 pages. Illustrated. 1893. \$2.50

Dyeing. A manual of dyeing; for the use of practical dyers, manufacturers, students, and all interested in the art of dyeing. By Edmund Knecht, Christopher Rawson and Richard Lowenthal. With numerous illustrations and specimens of dyed fabrics. 1 vol. 8vo, cloth. 1893. \$15.00

The Dynamo. Its theory, design and manufacture. By C. C. Hawkins and F. Wallis. With 150 illustrations. 520 pages. 1 vol. cloth. 1893. \$3.00

Dynamo. How to manage the dynamo. A handbook for ship engineers, electric light engineers and electroplaters. By S. R. Buttone. 12mo, cloth. 63 pages. 1893. \$0.60

Electricity and Magnetism. A popular introduction. By S. R. Buttone. 1 vol. 12mo. 243 pages. Illustrated. London, 1893. \$75

Forest Planting. A treatise on the care of timber lands and the restoration of denuded woodlands on plains and mountains. By H. N. Jacobow. Illustrated. 12 mo, cloth. 237 pages. 1893. \$1.50

Foundations. A practical treatise on foundations, explaining fully the principles involved. By W. M. Patton. One vol. 8vo. 402 pages. 22 folding plates. 1893. \$4.00

Irrigation. Manual of irrigation engineering. By Herbert M. Wilson. One vol. 8vo, cloth. 351 pages. Illustrated. 1893. \$4.00

Lime. A manual on lime and cement, their treatment and use in construction. By A. H. Heath. One vol. 12mo, cloth. 215 pages. 1893. \$2.50

Liquors and Preserves. The manufacture of. Translated from the French of J. DeBrevans. With 65 illustrations. 19 tables. 200 pages. 12mo, cloth. 1893. \$3.00

Locomotive Catechism. Containing nearly 1,300 questions and answers concerning designing and constructing, repairing and running various kinds of locomotive engines. Intended as examination questions and to post and remind the engine runner, fireman, or learner. By Robert Grimshaw. One vol. cloth, 362 pages, 175 illustrations. Containing a full description, with large folding plate, of the famous engine No. 666, recently built and operated by the N. E. & W. R. R. 7 folding plates. 1893. \$2.00

Metal-Plate Work. Its patterns and their geometry; also notes on metals and rules in mensuration. By C. T. Mills. Second edition enlarged. 377 pages. 1893. \$3.50

Municipal Improvements. A manual of the methods, utility and cost of public improvements, for the municipal officer. By W. F. Goodhue. 12mo, cloth. 1893. \$1.50

Needlework. A text-book of needlework, knitting and cutting out, with methods of teaching. By Elizabeth Roseway. With original illustrations and sectional diagrams. 460 pages. 1893. \$1.75

Photography. Practical pocket-book of photography. A short guide to the practice of all the usual photographic processes for professionals and amateurs. By Dr. E. Vogel. Translated by E. C. Conrad, F.R.S., from the second German edition. With many illustrations and a copious index. 202 pages. Cloth. \$1.00

Public Health. A treatise on public health and its application in different European countries. By Albert Palmberg and Arthur Newsholme. One vol. 8vo, cloth. 182 illustrations. 539 pages. 1893. \$5.00

Pumping Machinery. A practical handbook relating to the construction and management of steam and power pumping machines. By W. M. Barr. With upward of 200 engravings, covering every essential detail in pump construction. 447 pages. Cloth. 1893. \$5.00

Rocks Classified and Described. A treatise on lithology. By Bernhard von Cotta, with English, German and French synonyms. Translated by P. H. Lawrence. One vol. 8vo, cloth. 430 pages. 1893. \$4.50

Soap Manufacture. A practical treatise on the fabrication of hard and soft soaps, and analytical methods for the determination of their chemical composition. By W. L. Gadd. One vol. cloth. 224 pages. Illustrated. 1893. \$1.50

Sound and Music. By Rev. J. A. Zahm, C.S.C., Professor of Physics in the University of Notre Dame. 452 pages. Illustrated. 1892. \$3.50

Star Maps and Luminous Stars. A method for quickly learning the names and positions of the constellations, the movements of the planets, etc. By R. A. Proctor and A. E. Beach. One quarto vol. cloth. 1893. \$2.50

Street Railway Motors. With descriptions and cost of plants, and operation of the various systems in use or proposed for motive power on street railways. By Herman Haupt. One vol. cloth. 213 pages. 1893. \$1.75

Telephone Lines and their Properties. By Wm. J. Hopkins. 258 pages. Illustrated. London. 1893. \$1.50

The Great Barrier Reef of Australia; Its Products and Potentialities. Containing an account, with copious Colored and Photographic Illustrations (the latter here produced for the first time), of the Coral and Coral Reefs, Pearl and Pearl-Shell, Beche-de-Mer, other Fishing Industries, and the Marine Fauna of the Australian Great Barrier Region. By W. Saville Kent. 16 Chromo plates and 48 plates in Photomicrotype. Super-Royal 4to. Cloth. London, 1893. \$30.00

Telegraphic Connections. Embracing recent methods in Quadruplex Telegraphy. By Charles Thorn and Willis H. Jones. One oblong volume. Cloth. 50 pages, 20 plates, colored. \$1.50

FREE.

Our entirely new Catalogue of Scientific and Technical Books, containing over 3,000 titles, and embracing more than 300 different subjects, with Authors' Index, will be mailed free on application to any address in the world. Address

MUNN & CO.,
Publishers of the "Scientific American,"
361 Broadway, New York.

Advertisements.

ORDINARY RATES.

Inside Page, each insertion, - 75 cents a line
Back Page, each insertion, - \$1.00 a line

For some classes of Advertisements, Special and Higher rates are required.

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.

COLD FORGED PRODUCT.

Forged Wood Screw

Patented May 10, July 19, 1887; Oct. 23, 1889; Aug. 19, Oct. 21, 1890; April 7 May 12, 1891; July 19, 1892.

Its Advantages are:

1. Stronger than a common screw.
2. Uniform and wide slot.
3. Requires the use of but one bit in hard wood.
4. Inserted easier.
5. Centralized point.
6. Superior holding power.
7. The screw being Cold Forged, instead of Cut, leaves on its entire surface a metallic skin.

Send for samples to

AMERICAN SCREW CO.
PROVIDENCE, R. I.

WELL DRILLING MACHINERY,

MANUFACTURED BY

WILLIAMS BROTHERS,
ITHACA, N. Y.,

Mounted and on Sills, for
deep or shallow wells,
with steam or horse
power.

Send for
Catalogue.

ADDRESS
Williams Brothers
ITHACA, N. Y.

ELECTRO MOTOR, SIMPLE HOW TO
make. By G. M. Hopkins.—Description of a small electro motor devised and constructed with a view to assisting amateurs to make a motor which might be driven with advantage by a current derived from a battery, and which would have sufficient power to operate a foot lathe or any machine requiring not over one man power. With 11 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 641. Price 10 cents. To be had at this office and from all newsdealers.

A GENTLEMAN'S LAUNCH



YOUR OWN ENGINEER.

Launches 19 to 60 feet in length, with automatic machinery. No Smoke. No Engineer. No Danger. No Dirt.

PADDLE YOUR OWN CANOE.

Canoes, Family Row and Sail Boats. Fishing and Hunting Boats. Manufactured by

THOMAS KANE & CO., Chicago, Ill.

Send for catalogue specifying line desired.

Contentment

is folly when you might do better.

What is the matter with your time? A trifle fast? A little slow? Always a few minutes wrong?—Does your watch cost more to carry than it did to buy it? Repairs, regulating, cleaning; a dollar or two every time you bump it? You might save it over and over in a year; show just as much style and always be on time, too, with the new, quick-winding Waterbury.

Every jeweler keeps it. A jeweled watch. All styles for everybody. \$4 to \$15 buys it. Ladies', gentlemen's or boy's watch; cased in nickel, coin-silver or filled gold (10 to 14-karat).

PATENTS!

MESSRS. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine improvements, and to act as Solicitors of Patents for Inventors.

In this line of business they have had forty-five years' experience, and now have unequalled facilities for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Labels, Reliefs, Assignments, and Reports on Infringements of Patents. All business entrusted to them is done with special care and promptness, on very reasonable terms.

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reliefs, Assignments, Rejected Cases. Hints on the sale of Patents, etc.

We also send, free of charge, a Synopsis of Foreign Patent Laws, showing the cost and method of securing Patents in all the principal countries of the world.

MUNN & CO., Solicitors of Patents,
361 Broadway, New York.

BRANCH OFFICES.—Nos. 62 and 64 F Street, Pacific Building, near 7th Street, Washington, D. C.

**SINGLE CYLINDER AND COMPOUND
HIGH SPEED
ENGINES**
Watertown Steam Engine Co.
WATERTOWN, N. Y.

SEND FOR OUR CIRCULAR
IN ONE MINUTE
IT WILL CONVINCE YOU OF OUR ABILITY TO SUPPLY
TOILET PAPER FOR LESS MONEY THAN IT CAN BE OBTAINED ELSEWHERE.
A.P.W.PAPER CO. ALBANY, N.Y.

KODAKS.

Take one with You.
to the World's Fair.

They're the only practical camera for the purpose. No bulky glass plates—no troublesome holders—no need of hunting up a dark room. With our special Columbian spools of film, containing 200 exposures you can have your Kodak loaded before leaving home and can then "press the button" as often as you like, while at the Fair without the necessity of reloading.

Eastman Kodak Co.,

Send for Catalogue.

Rochester, N. Y.

4 to 50 H. P. THE Motor of 19th Century
Can be used any place, to do any work, and by any one. No Boiler! No Fire! No Steam! No Ashes! No Gauges! No Engineer! A perfectly safe Motor for all places and purposes. Cost of operation about one cent an hour to each indicated horse power. For circulars, etc., address
CHARTER GAS ENGINE CO.
P. O. Box 148, Sterling, Ill.

SCIENTIFIC AMERICAN SUPPLEMENT. Any desired back number of the SCIENTIFIC AMERICAN SUPPLEMENT can be had at this office for 10 cents. Also to be had of newsdealers in all parts of the country.

OIL WELL SUPPLY CO.

91 & 92 WATER STREET,
PITTSBURG, PA.

Manufacturers of everything needed for
ARTESIAN WELLS
for either Gas, Oil, Water, or Mineral Tests
Boilers, Engines, Pipe, Cordage,
Drilling Tools, etc. Illustrated
catalogue, price lists, and discount sheets on request.

AGENTS WANTED FOR FINE TOOLS IN EVERY SHOP.
WRITE FOR CATALOGUE AND AGENCY.
C. H. BESLY & CO.,
CHICAGO, ILL. U.S.A.

ELECTRIC SUPPLIES
MOTORS, and DYNAMOS,
from 1-6 h. p. to 15 h. p.
Bells, Annunciators, Batteries, etc. No Toys, but Standard Goods. Complete illustrated catalogue sent on receipt of 20c. postage.
The Holtzer-Cabot Electric Co.
84 Franklin St., BOSTON, MASS.

ZINC ETCHING
HALFTONE PROCESS
Printer
Engravings
MAGAZINES, BOOKS, SOUVENIRS.
CATALOGUE WORK A SPECIALTY
A. H. KELLOGG
SCOTT & BOWNE BUILDING
New York.

"IMPROVEMENT THE ORDER OF THE AGE."
The Smith Premier Typewriter
Embodies the most Progressive Mechanical Principles.
All the Essential Features Greatly Perfected.
Perfect and Permanent Alignment.
Easiest Running, and Nearly Silent.
All type cleaned in Ten Seconds without Soiling the Hands.
The Smith Premier Typewriter Co., Syracuse, N. Y., U. S. A.
We have 20 branch offices in the principal cities throughout the United States.

ASTRONOMY
Poole Bros. Celestial Planisphere and Celestial Handbook just published.
For descriptive circular address
POOLE BROS., CHICAGO, ILL.

Parsons Horological Institute.
Learn the Watch Trade
Engraving and Jewelry Work.
PARSONS, IDE & CO. Circular free.
302 Bradley Ave., PEORIA, ILL.

"OTTO"
GAS AND GASOLINE
ENGINES.
1/2 to 100 h. p. Can be used in cities or in country independent of gas works or gas machines.
No Boiler, No Danger, No Engineer.
OTTO GAS ENGINE WORKS, PHILADELPHIA.

HARTFORD STEAM BOILER
HARTFORD, CONN.
INSPECTION AND INSURANCE CO.

THE LIQUEFACTION OF AIR.—A lecture delivered by Prof. James Dewar before the Royal Institution on the production of liquid common air in bulk. With 9 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 646. Price 10 cents. To be had at this office and from all newsdealers.

DESIGNING AND BUILDING OF NEW MACHINERY.
SUPPLY AND INSTALLATION OF
STEAM ENGINES, PUMPS, ELECTRIC PLANTS.

COMPLETE ELECTRICAL EQUIPMENTS
—FOR—
ARC OR INCANDESCENT LIGHTING.
Arc Lamps. Incandescent Lamps. House Wiring Appliances.
MINIATURE LAMPS FOR DECORATIVE PURPOSES.
GENERAL ELECTRIC COMPANY,
DISTRICT OFFICES:
44 Broad Street, New York.
25 and 27 Adams Street, Chicago, Ill.
514 and 520 West Street, Cincinnati, O.
120 N. 3rd Street, St. Louis, Mo.
15 First Street, San Francisco, Cal.
620 Atlantic Avenue, Boston, Mass.
409 Arch Street, Philadelphia, Pa.
411-417 Sibley Street, St. Paul, Minn.
1209 F Street, N. W., Washington, D. C.
Market Temple, Denver, Colo.
All business outside the U. S. transacted by Thomson-Houston International Electric Co. 44 Broad St. New York

ENGINES, BOILERS & MACHINE TOOLS.
Complete outfits furnished. Send for prices and 300 p. catalogue. W. P. DAVIS, Rochester, N. Y.

"The ease of cycling is in the tire."
Columbia Bicycles are fitted with the
COLUMBIA PNEUMATIC TIRE
The Columbia catalogue is the most readable book of its class—beautifully illustrated—free at Columbia agencies—by mail for two 2-cent stamps.
Guaranteed against puncture. Fastest and most resilient. Built to last.
POPE MFG. CO.,
Boston. New York. Chicago. Hartford.

PATENT JACKET KETTLES
Plain or Porcelain Lined.
Tested to 100 lb. pressure. Send for Lists.
BARROWS-SAVERY CO.,
S. Front & Reed Streets, Philadelphia, Pa.

Scientific Book Catalogue
RECENTLY PUBLISHED.
Our new catalogue containing over 100 pages, including works on more than fifty different subjects. Will be mailed free to any address on application.
MUNN & CO., Publishers Scientific American,
361 Broadway, New York.

THE STANDARD
H. W. JOHNS & CO.
NEW YORK
PATENTED

The American Bell Telephone Company
125 MILK ST., BOSTON, MASS.

This Company owns the Letters Patent No. 186,787, granted to Alexander Graham Bell, January 30, 1877, the scope of which has been defined by the Supreme Court of the United States in the following terms:

"The patent itself is for the mechanical structure of an electric telephone to be used to produce the electrical action on which the first patent rests. The third claim is for the use in such instruments of a diaphragm, made of a plate of iron or steel, or other material capable of inductive action; the fifth, of a permanent magnet constructed as described, with a coil upon the end or ends nearest the plate; the sixth, of a sounding box as described; the seventh, of a speaking or hearing tube as described for conveying the sounds; and the eighth, of a permanent magnet and plate combined. The claim is not for these several things in and of themselves, but for an electric telephone in the construction of which these things or any of them are used."

This Company also owns Letters Patent No. 463,569, granted to Emile Berliner, November 17, 1891, for a Combined Telegraph and Telephone; and controls Letters Patent No. 474,231, granted to Thomas A. Edison, May 3, 1892, for a Speaking Telegraph, which cover fundamental inventions and embrace all forms of microphone transmitters and of carbon telephones.

REVERVED CHARTER
GAS ENGINES
USING LINE...
RELIABLE...
DELICATE...
H. W. CALDWELL & SON
SOLE MFRS.
WASHINGTON & UNION STS. CHICAGO, ILL.

PRINTING INKS.
The SCIENTIFIC AMERICAN is printed with CHAS. NEWBURY JOHNSON & CO.'S INK, Tenth and Lombard Sts., Philadelphia, and 47 Rose St., opp. Duane, New York